RUSH

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT

SOLID STATE PORTABLE STEREO PHONOGRAPH

MODEL GD-107

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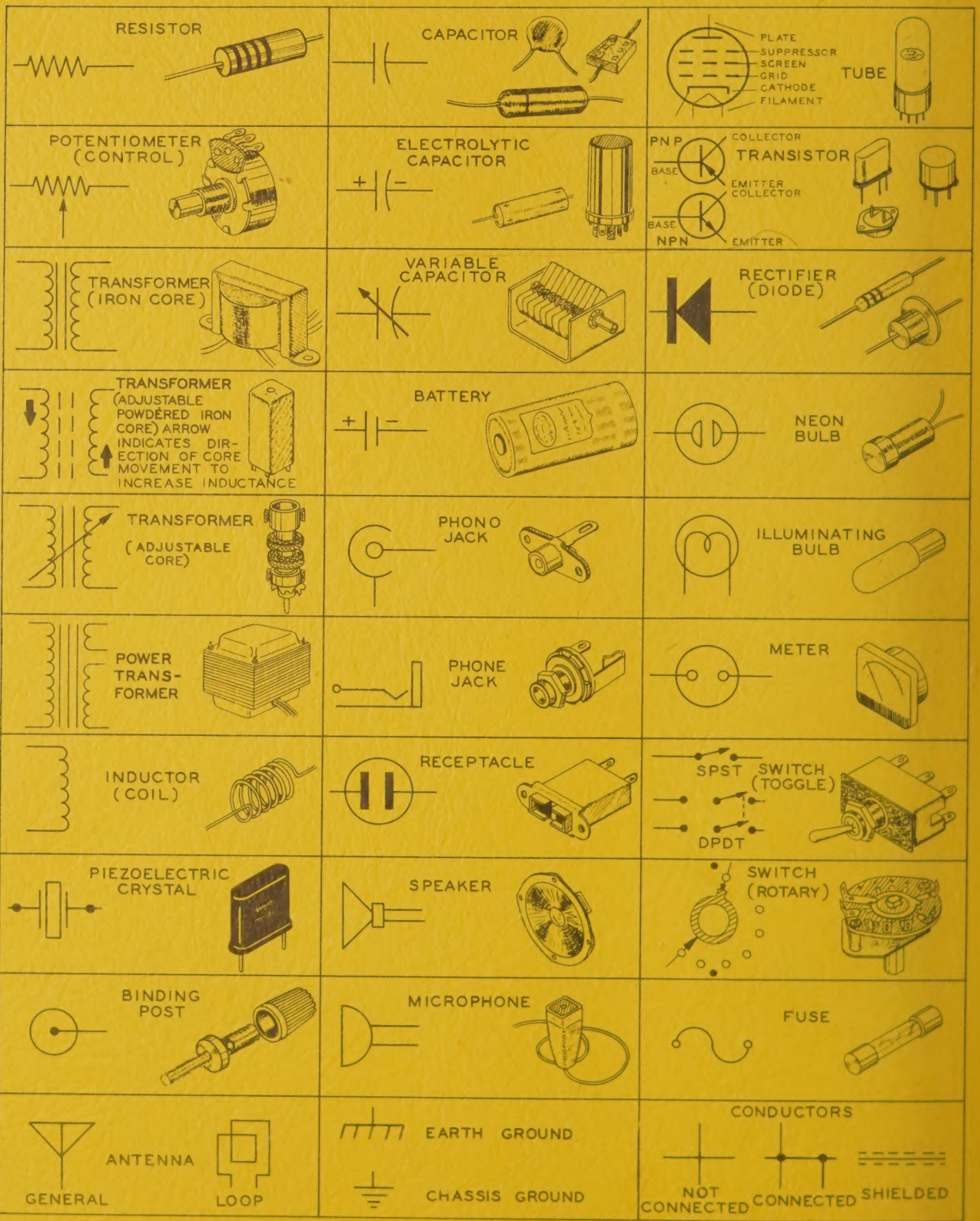
595-888-01
10-3-69

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



Assembly
and
Operation
of the

HEATHKIT®

SOLID STATE PORTABLE STEREO RECORD PLAYER

MODEL GD-107

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Model GD-107 Portable Stereo Record Player uses the latest design techniques to give you exceptionally good volume and tone quality in a compact, attractive unit. The solid-state amplifier circuits assure you of dependable, trouble-free operation.

All standard record sizes and speeds can be played on this automatic 4-speed record changer. It is spring mounted and can be locked down when the Record Player is being transported.

Polyethyline covering is used to cover the sturdy pressed-wood cabinet. The construction and internal design of the cabinet makes an effective enclosure for the speakers to provide high-quality music reproduction.

As you proceed to check the parts and assemble the kit, be sure to follow the instructions carefully.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

The numbers in parentheses are keyed to the numbers on the Parts Pictorial (fold-out from Page 3).

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS		
1/2 Watt		
(1) 1-155	2	24 Ω (red-yellow-black)
1-103	2	33 Ω (orange-orange-black)
1-9	2	1000 Ω (brown-black-red)
1-81	2	1500 Ω (brown-green-red)
1-114	2	8200 Ω (gray-red-red)
1-60	2	68 KΩ (blue-gray-orange)
1-29	2	220 KΩ (red-red-yellow)
1-33	4	470 KΩ (yellow-violet-yellow)
2 Watt		
(2) 3-5-2	4	2.2 Ω wire-wound (red-red-gold)

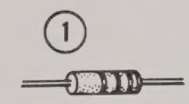
NOTE: These four resistors are physically smaller than the 2-watt composition resistor shown in the Kit Builders Guide.

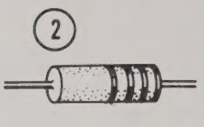
CAPACITORS		
Disc		
(3) 21-7	2	33 pf
21-56	2	470 pf
21-36	2	.002 μfd

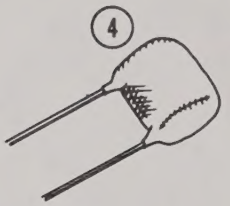
PART No.	PARTS Per Kit	DESCRIPTION
Resin		
NOTE: The resin capacitors may be color-coded, or the value may be printed on them. Refer to the chart on the Parts Pictorial for color code information.		
(4) 27-47	2	.1 μfd (brown-black-yellow)
Electrolytic		
(5) 25-115	2	10 μfd
(6) 25-160	2	250 μfd
(7) 25-154	1	2500 μfd
CONTROLS		
(8) 10-217	1	3 megohm control (Balance)
(9) 12-82	1	3 megohm dual control (Tone)
12-81	1	2 megohm dual control (Volume)
DIODE-TRANSISTORS		
(10) 57-27	1	Silicon diode
(11) 417-118	4	2N3393 transistor
NOTE: The two envelopes marked 117-6 each contain two matched transistors. After checking them against the Parts List, place the transistors back in the envelope.		
117-6	2	Matched pair of transistors
Each pair consists of:		
(12) 417-121	1	2N2430 transistor
417-122	1	2N2431 transistor
WIRE-CABLE-SLEEVING		
344-15	1	Black stranded wire
344-16	1	Red stranded wire
343-7	1	Shielded cable
346-7	1	Clear sleeving

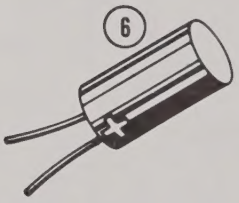
PART No.	PARTS Per Kit	DESCRIPTION
HARDWARE		
(13) 250-4	2	4-40 x 3/8" screw
(14) 254-9	2	#4 lockwasher
(15) 252-2	2	4-40 nut
(16) 250-8	3	#6 x 3/8" sheet metal screw
(17) 252-3	8	6-32 nut
(18) 254-1	8	#6 lockwasher
(19) 432-66	6	Terminal strip connector
(20) 438-4	2	Phono plug
(21) 207-3	1	Cable clamp
(22) 215-19	4	Transistor heat sink
MISCELLANEOUS		
415-22	1	Record changer (Maestro Model 52-93) with Sonotone 61T-SD cartridge, 45 rpm adapter, and line cord
85-175-2	1	Circuit board
91-154	1	Cabinet
(23) 204-781	1	Transistor mounting bracket
(24) 261-28	4	Plastic foot
391-39	1	Heathkit nameplate
401-110	2	Speaker
462-200	3	Knob
(25) 490-5	1	Nut starter
597-308	1	Kit Builders Guide
597-260	1	Parts Order Form
391-34	1	Blue and white label
	1	Manual (See front cover for part number.)
		Solder

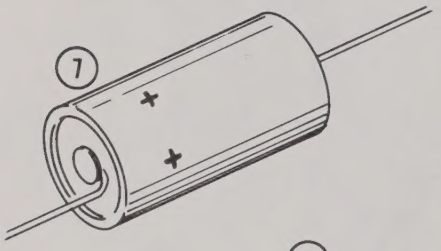
PARTS PICTORIAL

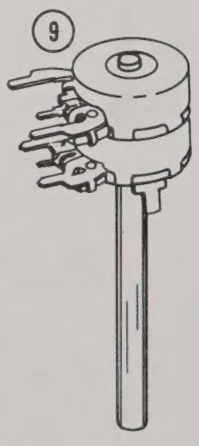


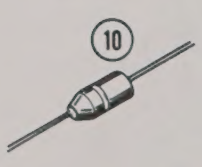


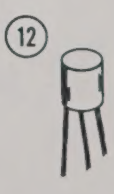


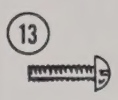


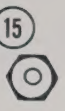


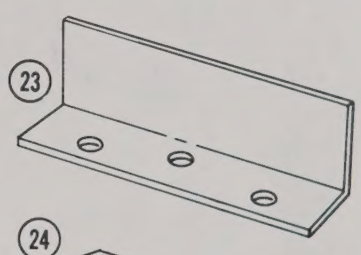


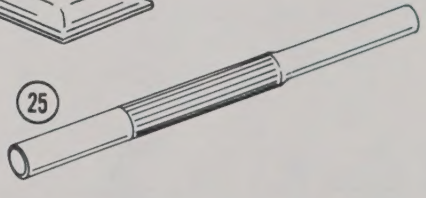




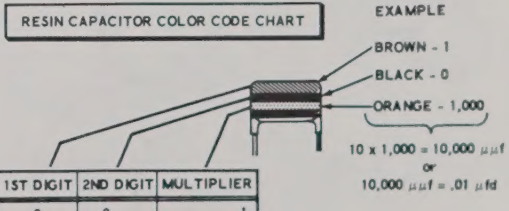




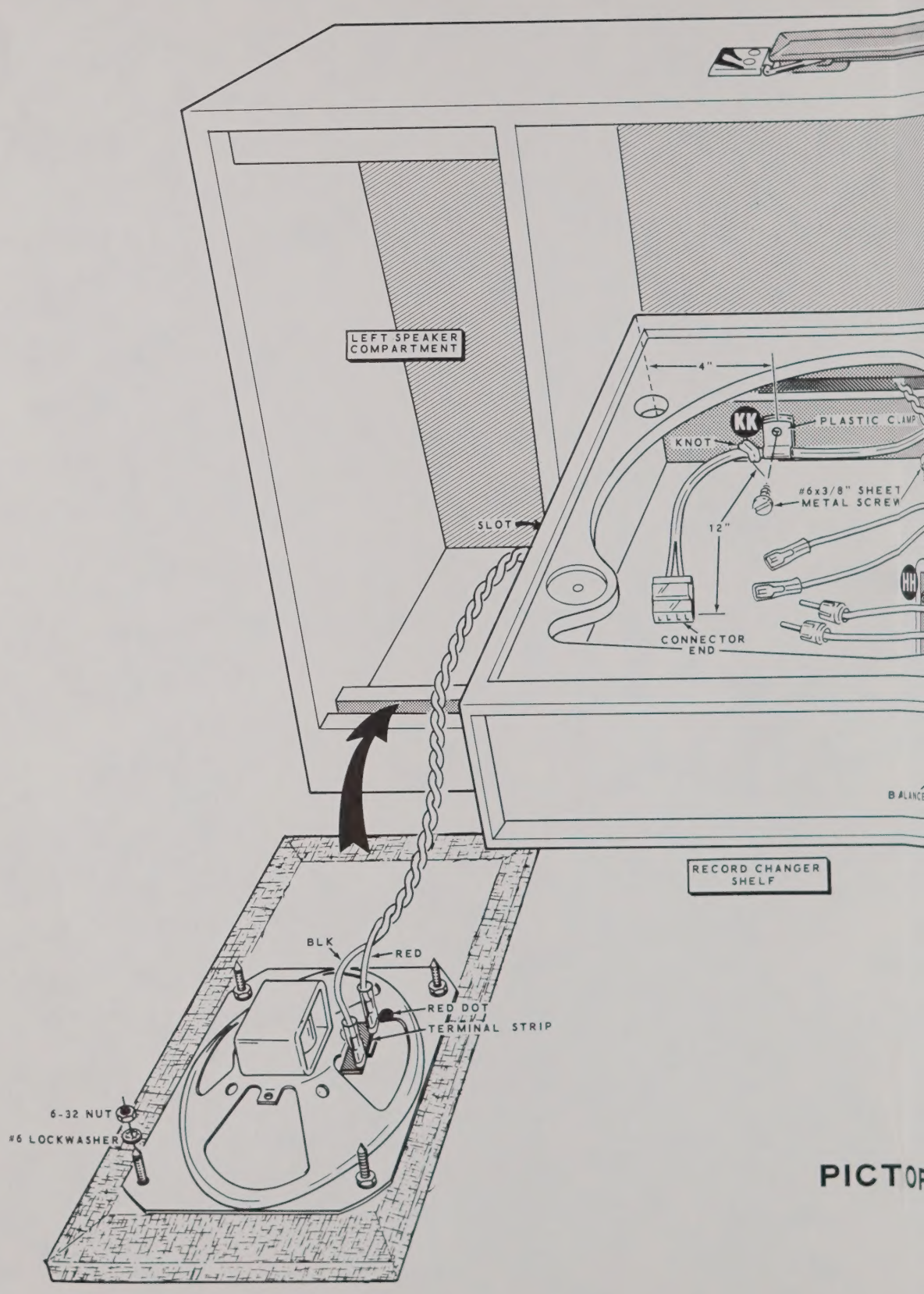




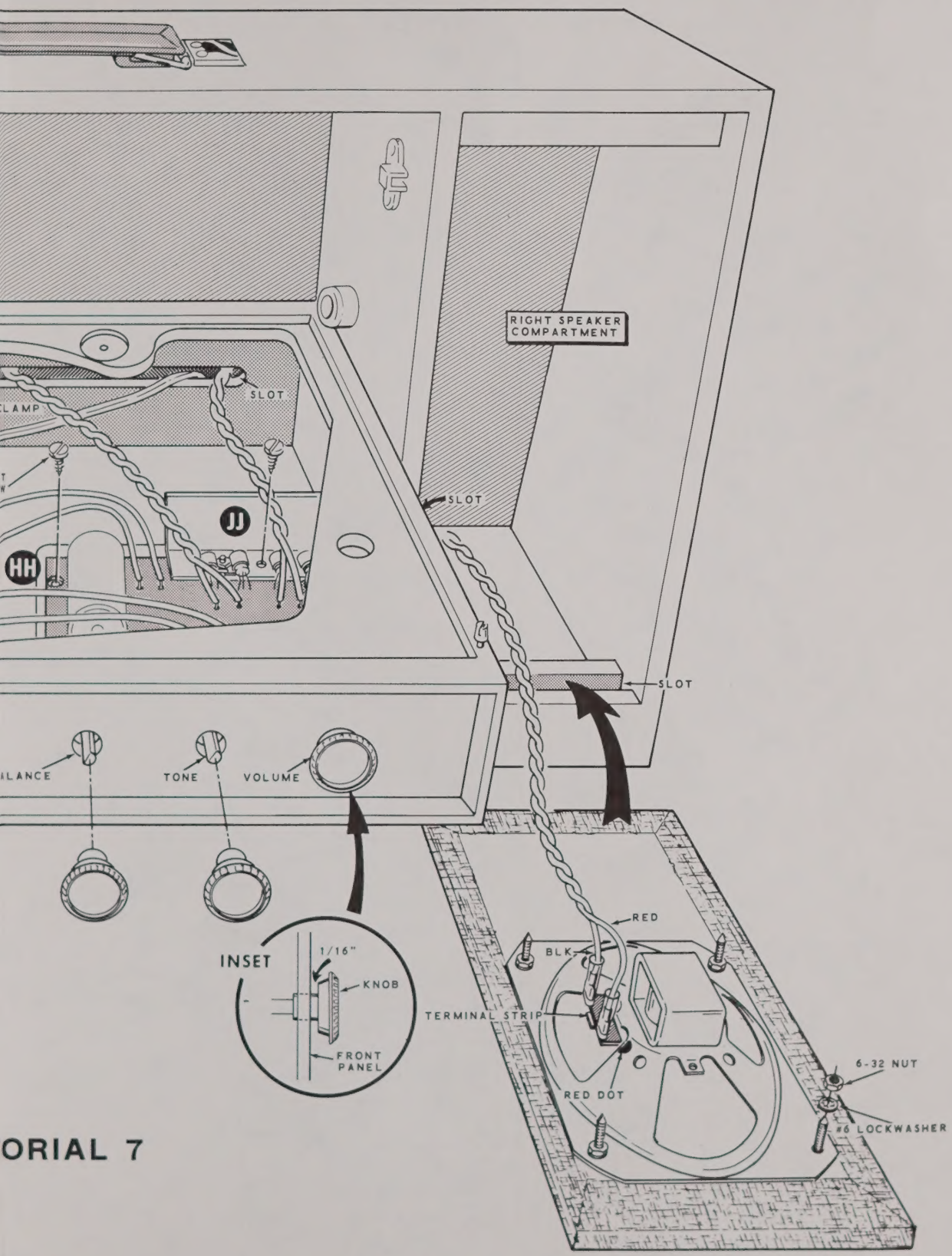
RESIN CAPACITOR COLOR CODE CHART



COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000


LEFT SPEAKER COMPARTMENT
4"
KK
PLASTIC CLAMP
KNOT
#6x3/8" SHEET METAL SCREW
SLOT
12"
HH
CONNECTOR END
BALANCE
RECORD CHANGER SHELF
BLK
RED
RED DOT
TERMINAL STRIP
6-32 NUT
#6 LOCKWASHER

PICTOR


RIGHT SPEAKER COMPARTMENT
SLOT
SLOT
SLOT
JJ
HH
TONE
VOLUME
INSET
1/16"
KNOB
FRONT PANEL
RED
BLK
TERMINAL STRIP
RED DOT
6-32 NUT
#6 LOCKWASHER

ORIAL 7

STEP-BY-STEP ASSEMBLY

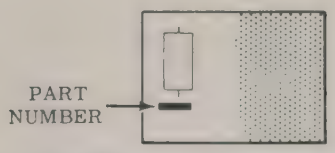
Before you start the circuit board assembly, be sure to read the Circuit Board Parts Mounting and Soldering sections (Pages 11, 12, and 13) of the Kit Builders Guide.

Resistors will be called out by the resistance value (in Ω or KΩ) and color code. Use 1/2 watt resistors unless directed otherwise in a step.

Capacitors will be called out by the capacitance value (in pf or μfd) and type (disc, electrolytic, or resin).

Position the circuit board as shown in the identification drawing on Pictorial 1. Then complete each step on the Pictorial.

NOTE: Only one-half of the circuit board is shown in Pictorial 1. The identification drawing shows the area of the circuit board to be assembled.



IDENTIFICATION DRAWING

START

( ) 2.2 Ω (red-red-gold) 2 watt.

( ) 1000 Ω (brown-black-red).

( ) 24 Ω (red-yellow-black).

( ) 2.2 Ω (red-red-gold) 2 watt.

( ) 8200 Ω (gray-red-red).

( ) 33 Ω (orange-orange-black).

( ) 470 KΩ (yellow-violet-yellow).

( ) 10 µfd electrolytic. Position the positive (+) lead as indicated on the circuit board.

( ) Solder all leads to the foil and cut off the excess lead lengths.

( ) 470 pf disc.

( ) 470 KΩ (yellow-violet-yellow).

NOTE: The resin capacitors may either be color coded or marked with a value.

( ) .1 µfd resin (brown-black-yellow).

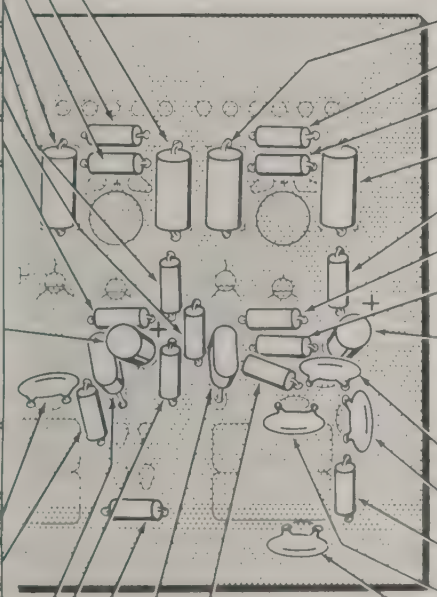
( ) 1500 Ω (brown-green-red).

( ) 470 KΩ (yellow-violet-yellow).

( ) .1 µfd resin.

( ) 220 KΩ (red-red-yellow).

( ) Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) 2.2 Ω (red-red-gold) 2 watt.

( ) 1000 Ω (brown-black-red).

( ) 24 Ω (red-yellow-black).

( ) 2.2 Ω (red-red-gold) 2 watt.

( ) 8200 Ω (gray-red-red).

( ) 470 KΩ (yellow-violet-yellow).

( ) 1500 Ω (brown-green-red).

( ) 10 µfd electrolytic. Position the positive (+) lead as shown.

( ) Solder all leads to the foil and cut off the excess lead lengths.

( ) .002 µfd disc.

( ) .002 µfd disc.

( ) 220 KΩ (red-red-yellow).

( ) 33 pf disc.

( ) 33 pf disc.

( ) Solder all leads to the foil and cut off the excess lead lengths.

PROCEED TO PICTORIAL 2.

PICTORIAL 1

START

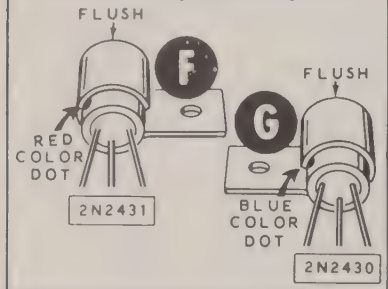
Locate the following parts:

( ) Two transistor heat sinks.

( ) One 2N2430 and one 2N2431 matched pair transistors (packed in envelope marked 117-6). These transistors must have the same single letter designation printed on top of the case.

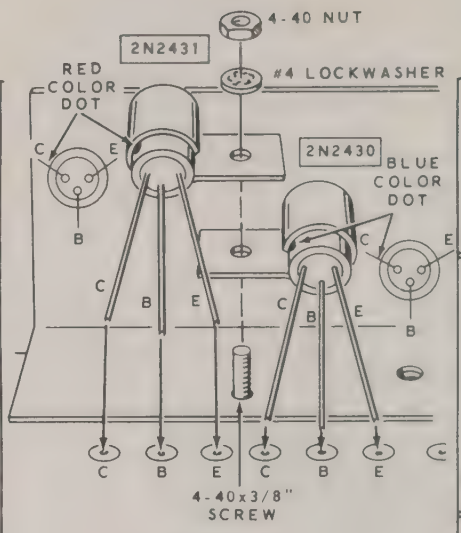
( ) Position one of the heat sinks as shown at F. Insert the 2N2431 transistor into the heat sink. Make sure the red color dot is positioned to the left and the top of the transistor is flush with the edge of the heat sink. NOTE: The transistor should fit snugly in the heat sink. However, if it is difficult to install the transistor, open the heat sink slightly with the blade of a screwdriver.

Set this assembly aside temporarily.

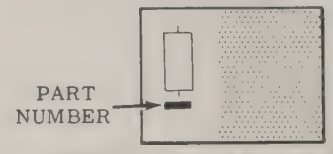


( ) Position the other heat sink as shown at G. Insert the 2N2430 transistor into the heat sink. Make sure the blue color dot is positioned to the left and the top of the transistor is flush with the edge of the heat sink.

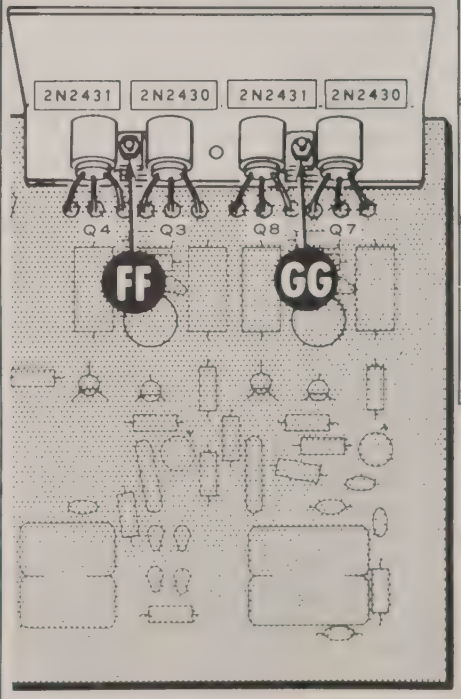
( ) Install the 2N2430 transistor-heat sink at Q3 and the 2N2431 transistor-heat sink at Q4 as shown in Detail 2A and Pictorial 2. Insert the leads into their correct holes which are indicated by C, B, and E. The color dot is next to the C (collector) lead. Push the leads into the holes approximately 1" and leave them this way temporarily. NOTE: The screws, lockwasher, and nuts will be installed in a later step.



Detail 2A



IDENTIFICATION DRAWING



CONTINUE

( ) Repeat the steps in the left column with the remaining two heat sinks and 2N2430 and 2N2431 transistors. In the last step however, the transistors will be installed at Q7 and Q8 instead of Q3 and Q4.

Locate the following parts:

( ) The transistor mounting bracket.

( ) Two 4-40 x 3/8" screws.

( ) Two #4 lockwashers.

( ) Two 4-40 nuts.

( ) Place the transistor mounting bracket on the circuit board so the three holes in the bracket and board line up properly. Then insert a 4-40 x 3/8" screw through the hole at FF as shown in the Pictorial. Hold the screw and bracket in place as you proceed to the next step.

( ) Place the heat sinks on the screw at FF as shown in Detail 2A. Then fasten them with a #4 lockwasher and a 4-40 nut.

( ) In a similar manner, mount the other two heat sinks at GG. Use a 4-40 x 3/8" screw, a #4 lockwasher, and a 4-40 nut.

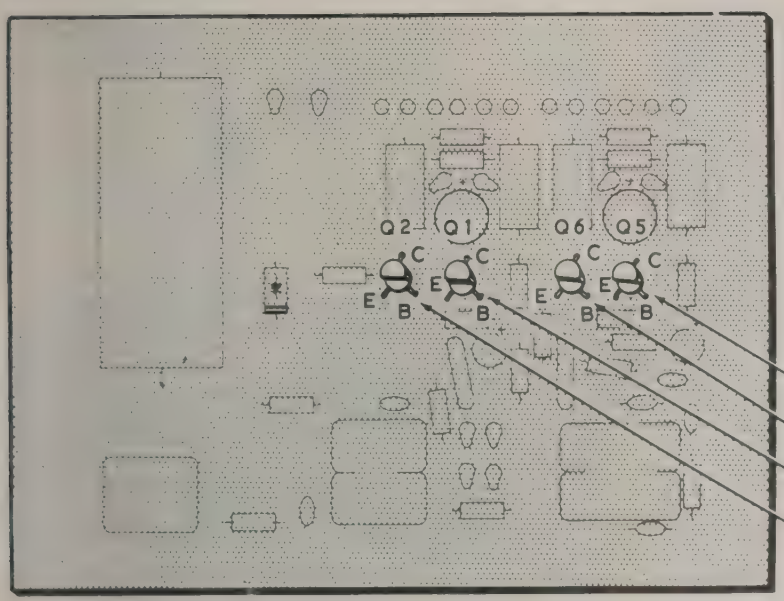
( ) Make sure that the transistor leads are in the correct holes and are not touching each other or the bracket. Then turn the board over, solder the leads to the foil, and cut off the excess lead lengths.

PROCEED TO PICTORIAL 3.

PICTORIAL 2

START

NOTE: Install the 2N3393 transistors (#417-118) in the following manner as shown: First line up the flat of the transistor with the outline of the flat on the circuit board. Then insert the transistor leads into their correct holes, which are indicated by C, B, and E. Position the transistors 1/4" away from the circuit board. Then solder each lead to the foil and cut off the excess lead lengths.



( ) 2N3393 at Q5.

( ) 2N3393 at Q6.

( ) 2N3393 at Q1.

( ) 2N3393 at Q2.

PROCEED TO PICTORIAL 4.

PICTORIAL 3

START

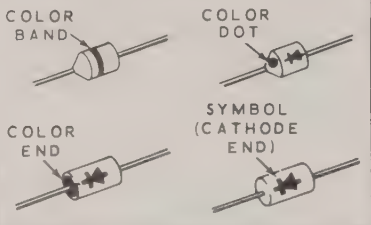
NOTE: Solder the leads of the next two capacitors as each part is installed. Then cut off the excess lead lengths.

( ) 250 μfd electrolytic. Position the positive (+) lead as indicated on the circuit board.

( ) 250 μfd electrolytic. Position the positive (+) lead as shown.

( ) 33 Ω (orange-orange-black).

( ) Silicon diode. Position the cathode end as shown. The cathode end is identified by a color band, color dot, color end, or symbol.



( ) 2500 μfd electrolytic. Position the positive (+) lead as shown.

( ) 68 KΩ (blue-gray-orange).

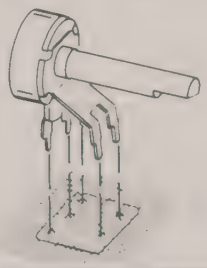
( ) 470 pf disc.

( ) 68 KΩ (blue-gray-orange).

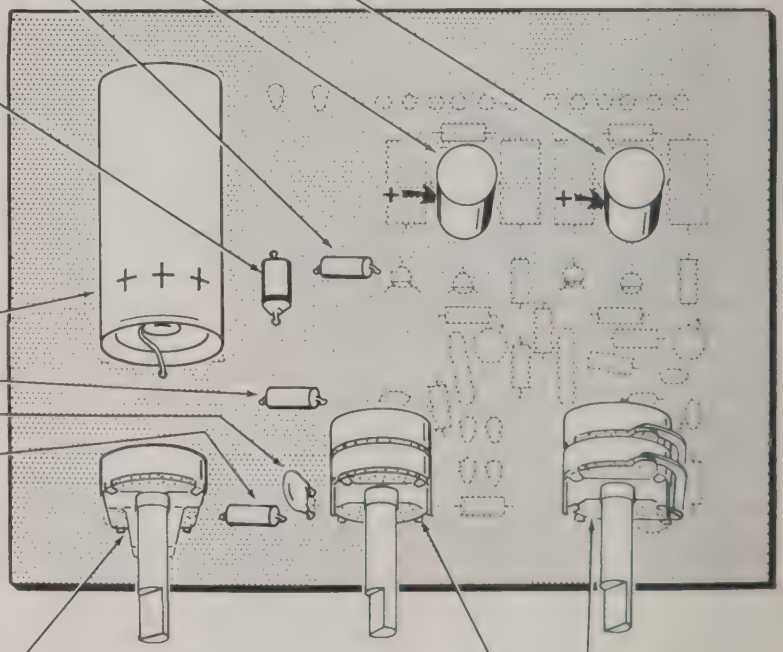
( ) Solder all leads that have not been soldered. Then cut off the excess lead lengths.

NOTE: Before soldering the controls in the following steps, make sure the lugs are all the way in the mounting holes.

( ) 3 megohm control (#10-217). Solder all five lugs to the foil.



CONTINUE

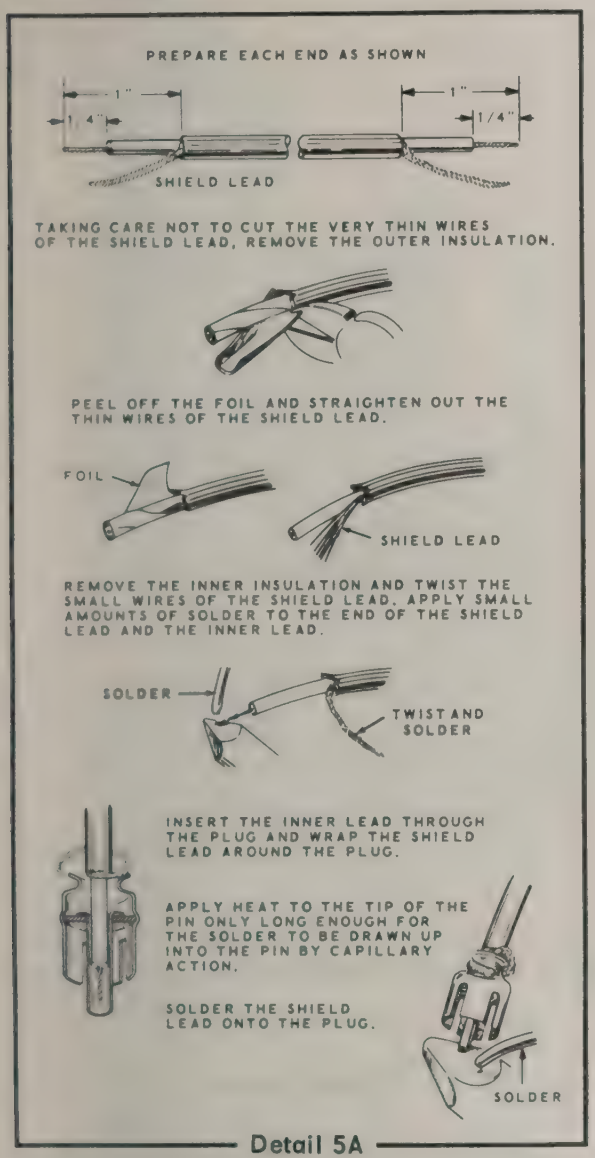


CONTINUE

( ) 3 megohm dual control (#12-82). Solder all six lugs to the foil.

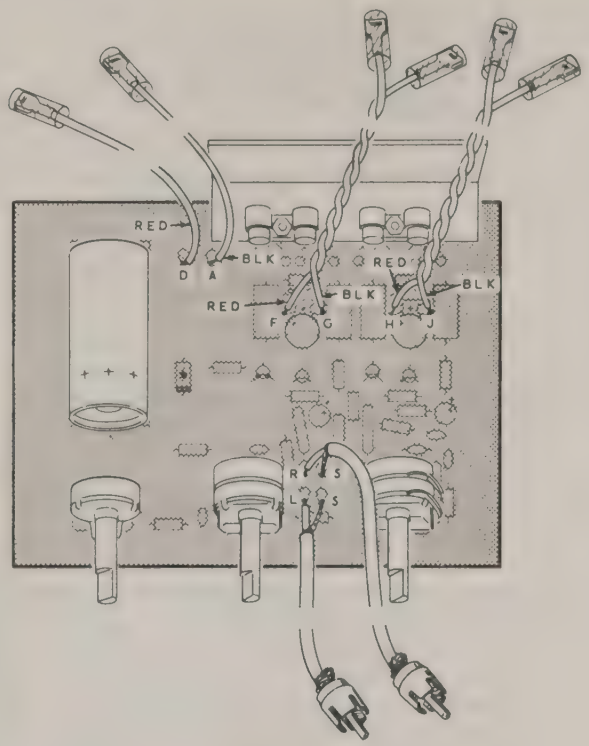
( ) 2 megohm dual control (#12-81). Solder all eight lugs to the foil.

PICTORIAL 4


PREPARE EACH END AS SHOWN
1"
1/4"
1"
1/4"
SHIELD LEAD
TAKING CARE NOT TO CUT THE VERY THIN WIRES OF THE SHIELD LEAD, REMOVE THE OUTER INSULATION.
PEEL OFF THE FOIL AND STRAIGHTEN OUT THE THIN WIRES OF THE SHIELD LEAD.
FOIL
SHIELD LEAD
REMOVE THE INNER INSULATION AND TWIST THE SMALL WIRES OF THE SHIELD LEAD. APPLY SMALL AMOUNTS OF SOLDER TO THE END OF THE SHIELD LEAD AND THE INNER LEAD.
SOLDER
TWIST AND SOLDER
INSERT THE INNER LEAD THROUGH THE PLUG AND WRAP THE SHIELD LEAD AROUND THE PLUG.
APPLY HEAT TO THE TIP OF THE PIN ONLY LONG ENOUGH FOR THE SOLDER TO BE DRAWN UP INTO THE PIN BY CAPILLARY ACTION.
SOLDER THE SHIELD LEAD ONTO THE PLUG.
SOLDER

Detail 5A

( ) Locate the shielded cable and cut it in half. Then refer to Detail 5A and prepare both ends of each cable as shown. Install a phono plug on one end of each cable.



PICTORIAL 5

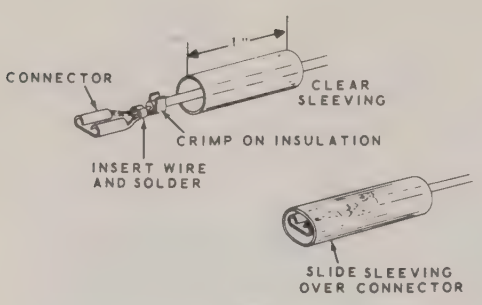
Refer to Pictorial 5 for the following steps.

( ) Position the circuit board as shown.

( ) Connect the inner lead of one cable to hole L (S-1) and the shield lead to hole S (S-1).

( ) Connect the inner lead of the remaining cable to hole R (S-1) and the shield lead to hole S (S-1).

( ) Cut a 12" black wire and a 12" red wire. Remove 1/8" of insulation from both ends of each wire and twist together the small wire strands.



Detail 5B

( ) Install terminal strip connectors and 1" lengths of clear sleeving on one end of each wire. Refer to Detail 5B.

( ) Connect the free end of the black wire to hole A of the circuit board (S-1).

( ) Connect the free end of the red wire to hole D of the circuit board (S-1).

( ) Cut the remaining lengths of black wire and red wire in half. Then remove 1/8" of insulation from both ends of each wire and twist together the small wire strands.

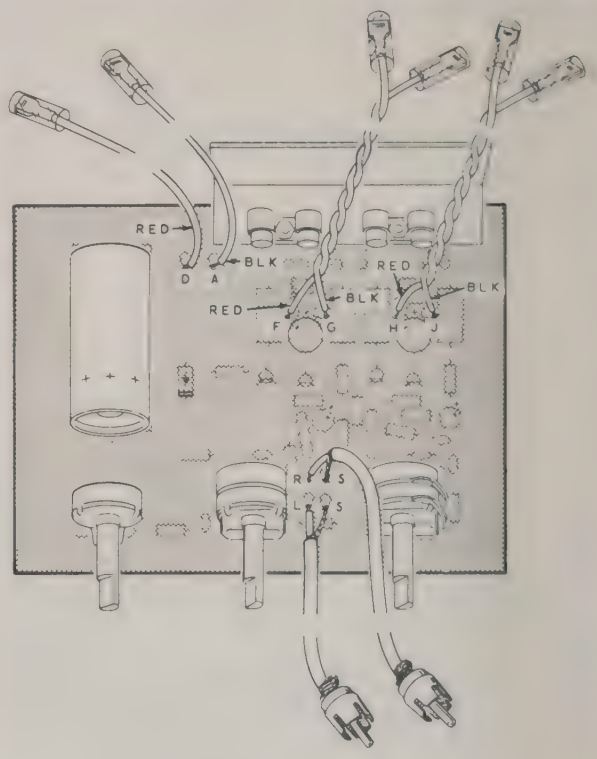
( ) Twist together a red and a black wire for their entire length. Then install 1" lengths of clear sleeving and terminal strip connectors on one end of the twisted pair as shown in Detail 5B. Be sure to slide the sleeving on the wire first.

( ) Repeat the preceding step with the other black wire and red wire.

Connect the free ends of one twisted pair to the circuit board as follows:

( ) Red wire to hole F (S-1).

( ) Black wire to hole G (S-1).



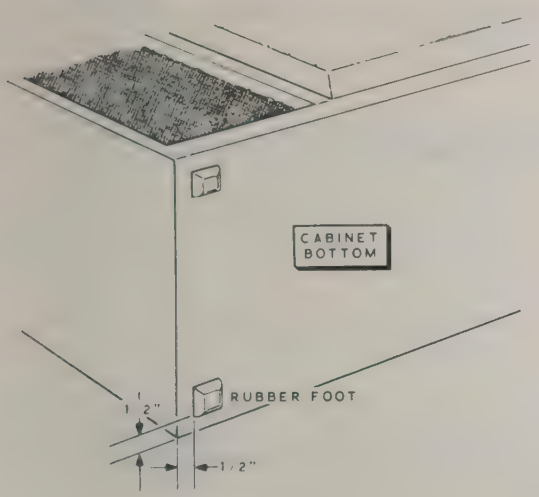
PICTORIAL 5
(Repeat)

Connect the free ends of the other twisted pair to the circuit board as follows:

( ) Red wire to hole H (S-1).

( ) Black wire to hole J (S-1).

( ) Carefully inspect the foil side of the circuit board for any solder bridges between foils. Solder any connections that might have been missed. Then set the circuit board aside temporarily.



PICTORIAL 6

CIRCUIT BOARD AND SPEAKER MOUNTING

( ) Lay the cabinet on its back with the bottom side toward you. Mark each bottom corner by measuring 1/2" in from each side as shown in Pictorial 6. Then install the rubber feet at these marked locations by removing the protective backing and pressing the feet in place.

Refer to Pictorial 7 (fold-out from Page 4) for the following steps.

( ) Position the cabinet as shown. Then remove the screws from the left and right speaker panels. Save the screws to refasten these panels later.

( ) Pull on the tape ends at the top of the speaker panels and remove the panels from the cabinet. Set the panels aside temporarily.

( ) Pull the record changer shelf down as shown.

( ) Place the circuit board inside the shelf with the three control shafts protruding through the front panel holes. Make sure none of the wires are positioned under the board.

( ) Install the knobs on the three control shafts. Align the flat of each shaft with the flat inside the knob, and then push the knob in place.

( ) Center the knobs in the holes and position them approximately 1/16" from the front panel as shown in the inset drawing on Pictorial 7. Hold the board in this position and make two starter holes in the shelf at HH and JJ with a sharp pointed tool. Then fasten the board in place with two #6 x 3/8" sheet metal screws. Put these screws in as straight as possible.

( ) Route the twisted pair of wires, coming from holes F and G on the circuit board, through the slot in the back of the changer shelf and the slot in the left speaker compartment.

( ) Repeat this same procedure with the other twisted pair of wires, but route them to the right speaker compartment.

( ) Locate and unwind the line cord (packed with the changer) and tie a knot in the cord 12" from the connector end as shown in the Pictorial. Then place a plastic clamp around the cord on the indicated side of the knot.

( ) Insert the connector end of the cord through the hole in the back of the cabinet and through the slot in the changer shelf.

( ) Make a starter hole in the rear panel of the shelf at KK approximately 4" from the left panel. Then fasten the plastic clamp at KK with a #6 x 3/8" sheet metal screw.

( ) Locate the right speaker panel and either speaker. NOTE: Handle the speakers carefully to avoid damaging the paper cone.

( ) Position the speaker panel with the four studs as shown. Position the speaker with the terminal strip to the left and place it over the panel studs. Fasten the speaker with four #6 lockwashers and four 6-32 nuts.

( ) Place this panel in front of the right speaker compartment as shown.

Connect the twisted pair of wires to the speaker terminal strip in the following steps. Push the connectors on the lugs firmly but carefully to avoid breaking the terminal strip.

( ) Red wire to the terminal strip lug which has the red dot near it.

( ) Black wire to the other terminal strip lug.

( ) Place the bottom edge of the speaker panel in the slot at the bottom of the compartment. Then push the top of the panel in place. The screws will be installed later.

( ) Position the left speaker panel with the four studs as shown. Position the speaker with the terminal strip to the right and place it over the panel studs. Fasten the speaker with four #6 lockwashers and four 6-32 nuts.

( ) Place the panel in front of the left speaker compartment. Then connect the twisted pair of wires on the terminal strip lugs as follows: Red wire to the lug with the red dot near it. Black wire to the other terminal strip lug.

( ) Place the speaker panel in place in the left compartment. The screws will be installed later.

RECORD CHANGER CONNECTIONS

Refer to Pictorial 8 for the following steps.

( ) Remove the changer from its shipping carton. Remove all packing material from the tone arm and control levers. Do not remove the foam dampeners from the two changer support springs. NOTE: Be sure the tone arm is locked down onto the rest post.

( ) Carefully set the record changer on the record changer shelf.

NOTE: The connector on the end of the line cord and the socket under the record changer base are a matched pair. They will fit together in only one way.

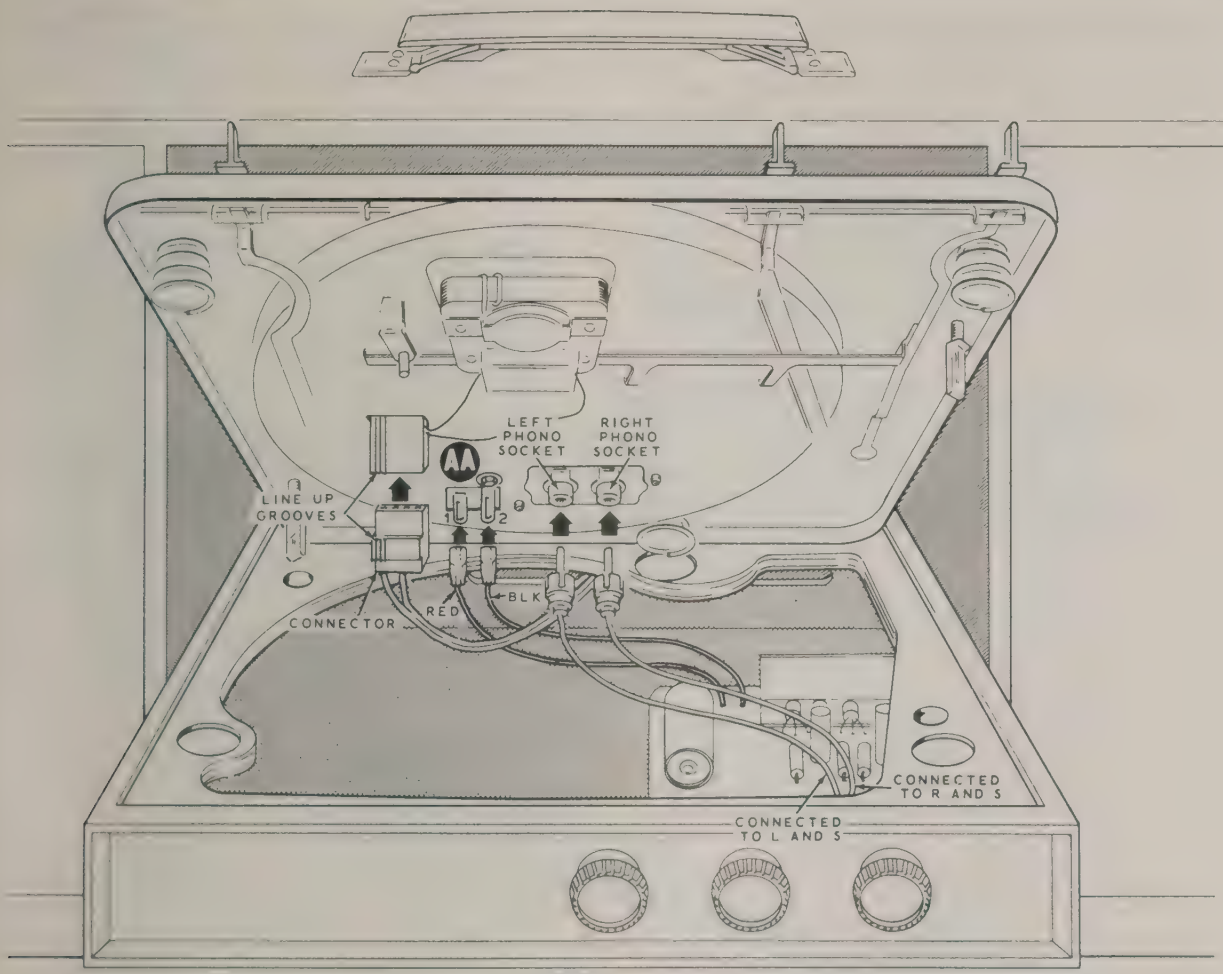
( ) Line up the matching grooves on the line cord connector and the changer socket. Press them together firmly until they snap into place.

( ) Connect the free end of the red wire, coming from the circuit board, to lug 1 of terminal strip AA. Push the connector firmly on the lug.

( ) Connect the free end of the black wire, coming from the circuit board, to lug 2 (ground lug) of terminal strip AA. Push the connector firmly on the lug.

( ) Locate the shielded cable which is connected to L and S on the circuit board. Insert the phono plug at the end of this cable into the left phono socket. Make sure the plug is in all the way.

( ) Insert the phono plug of the shielded cable which is connected to R and S into the right phono socket. Make sure this plug is also in all the way.


LEFT PHONO SOCKET
RIGHT PHONO SOCKET
AA
LINE UP GROOVES
1
2
RED
BLK
CONNECTOR
CONNECTED TO R AND S
CONNECTED TO L AND S

PICTORIAL 8

RECORD CHANGER MOUNTING

Refer to Pictorial 9 for the following steps.

NOTE: The record changer is held on the changer shelf by two mounting screws with flip-nuts. Flip these nuts from the inline (inset drawing #1) to the crosswise (inset drawing #2) position several times to become familiar with their operation before you mount the record changer. Then leave the flip-nuts in the in-line position.

( ) Turn the flip-nut at BB on its screw until it faces the direction shown in Pictorial 9.

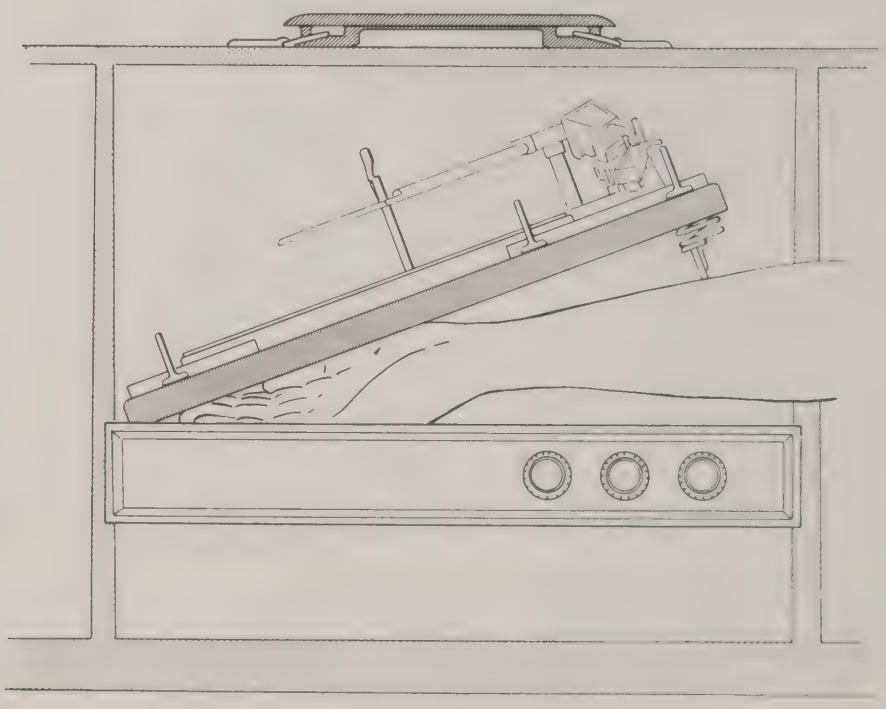
( ) Hold the record changer above the changer shelf and guide the flip-nut and mounting screw down through the mounting hole at BB.

( ) Reach your hand under the changer as shown in Detail 9A. Locate the flip-nut at BB and pull it in the crosswise position.

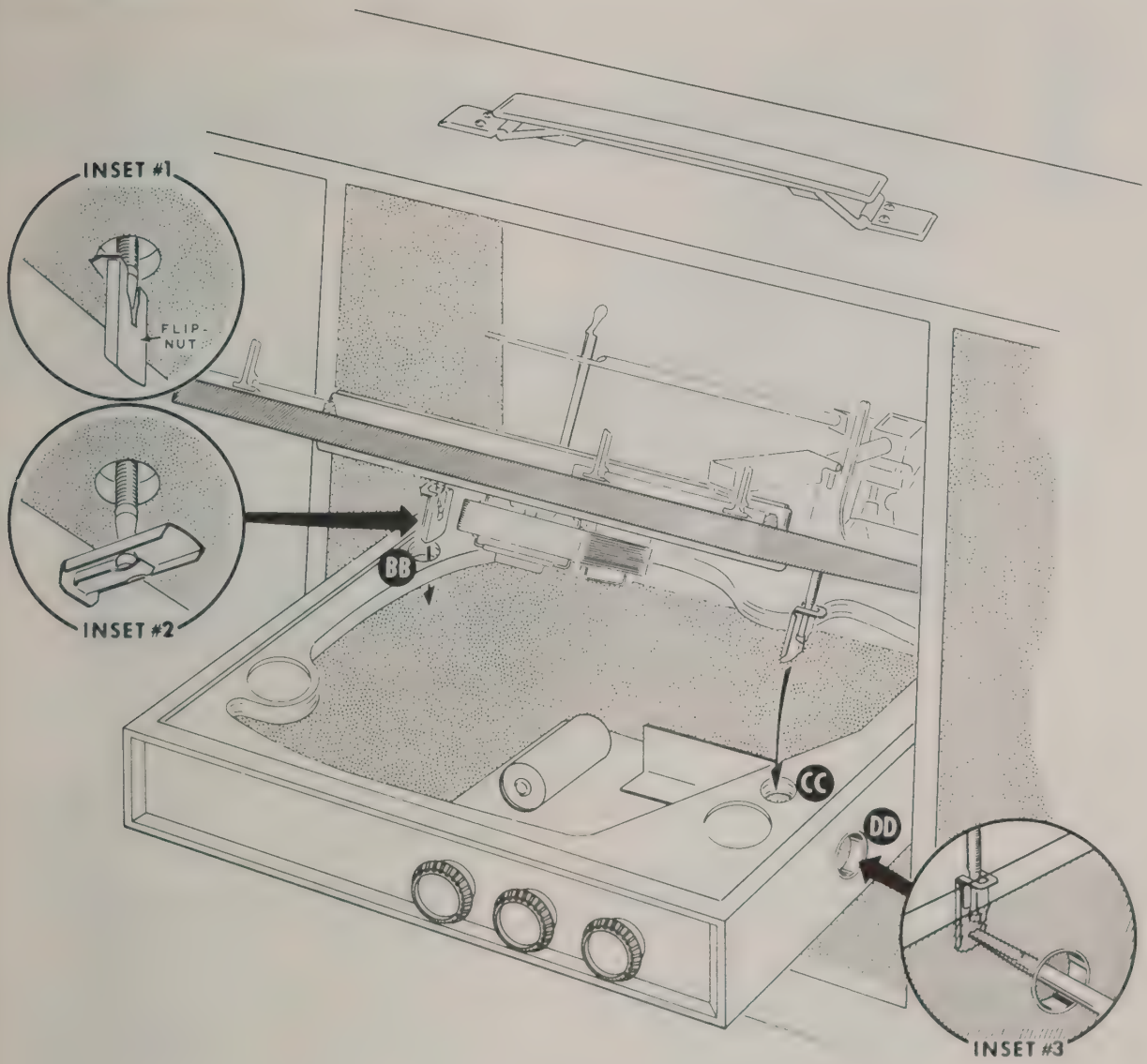
( ) Locate the flip-nut at CC. Turn the flip-nut on its screw until it faces in the direction shown.

( ) Guide the other flip-nut and mounting screw down through the mounting hole at CC. Use a screwdriver or some other suitable tool through access hole DD to push the flip-nut to the crosswise position as shown in inset drawing #3.

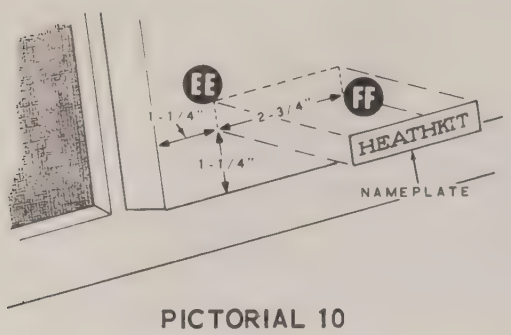
NOTE: When the flip-nuts are in their crosswise position, the record changer will be held in place regardless of the position of the changer shelf or cabinet.



Detail 9A



PICTORIAL 9



PICTORIAL 10

Refer to Pictorial 10 for the following steps.

( ) Close the changer shelf into the cabinet.

( ) Measure in 1-1/4" from the left edge and up 1-1/4" from the bottom edge of the changer shelf; mark a light dot at this point, EE.

( ) In a similar manner, measure and mark a light dot at point FF.

( ) Locate the Heathkit nameplate and carefully peel away the backing paper. Place the bottom corners of the nameplate at the dots at EE and FF. Then firmly press the nameplate into position.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the bottom of the cabinet. Be sure to refer to the numbers on this label in any communications you may have with the Heath Company about this kit.

This completes the assembly of your Record Player. Proceed to the Initial Test and Operation sections before you attempt to put the Record Player into use.

INITIAL TEST

Refer to Figure 1 for the following steps.

( ) Release the tone arm from its locked-down position on the rest post.

NOTE: The needle assembly is protected by either a plastic guard or metal clip. Refer to step 1 or step 2 and very carefully remove the guard or clip as shown.

1. Plastic guard: Slide the guard sidewise off the Needle Selector arm as shown in Figure 2A.

2. Metal clip: Slide the clip straight down away from the needle as shown in Figure 2B.

( ) Lift the record support arm (at its mounted end) and swing it away from the spindle.

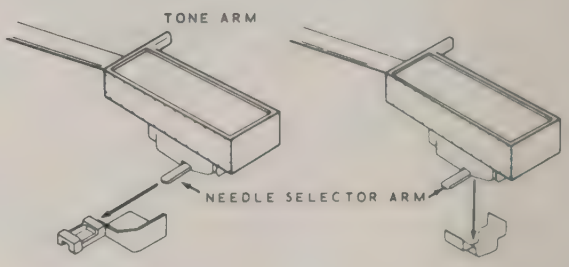


Figure 2A Figure 2B

( ) Place the Needle Selector arm in the LP position.

( ) Place a 33 rpm record on the spindle; then swing the record support arm back toward the spindle. Lower the support arm until it rests on top of the record.

Figure 1

( ) Slide the RECORD SPEED lever to the 33 position.

( ) Slide the RECORD SIZE lever to the position corresponding to the size of the record.

( ) Plug the line cord into a 120 V AC outlet.

( ) Slide the SWITCH lever to the REJ position and then release it.

( ) Watch carefully during the resulting change cycle to make sure everything seems to operate correctly. Refer to the Record Changer Troubleshooting Chart on Pages 22, 23, and 24 if changer problems occur.

( ) Turn the BALANCE control to its mid-position.

( ) Adjust the VOLUME and TONE control knobs to produce the desired sound.

( ) Slide the SWITCH lever to the REJ position and then release it. The tone arm should lift from the record and move over to the rest post. The complete unit should then shut off automatically.

( ) Remove the pull-out tapes from both speaker panels; then use the four screws previously removed to secure the panels to the cabinet.

This completes the Initial Test.

OPERATION

CAUTION: Always lock the tone arm down to the rest post before closing the changer shelf. This will keep the needle and the tone arm from being damaged.

AUTOMATIC OPERATION

1. Lift the record support arm and swing it away from the spindle.

2. Slide the RECORD SPEED lever to the number (16, 33, 45, or 78) that matches the record speed.

3. Slide the RECORD SIZE lever to the number (12, 10, or 7) that matches the size of the records to be played.

4. Turn the Needle Selector arm to the LP position for all 16, 33, and 45 rpm records. Turn the Needle Selector arm to the 78 position only for 78 rpm records.

5. Release the tone arm from its locked-down position on the rest post.

6. Place up to six records, all of the same size and playing speed, on the spindle.

7. Swing the record support arm back toward the spindle. Lower the arm until it rests on top of the stack of records.

8. Slide the SWITCH lever to the REJ position and release it.

9. Adjust the VOLUME control to produce the desired sound level.

10. Turn the TONE control clockwise to increase the treble (high) tones or counterclockwise to emphasize the bass (low) tones.

11. Turn the BALANCE control to give an equal amount of sound from each speaker. When you turn the control clockwise, you increase the sound from the right speaker and decrease the sound from the left speaker. Turning the control counterclockwise will increase the sound from the left speaker and decrease the sound from the right speaker.

After the last record has been played, the tone arm will lift from the record and set down on the rest post; then the complete Record Player will shut off automatically.

MANUAL OPERATION

1. Follow the first five steps listed under Automatic Operation.

2. Place a record on the turntable. Slide the SWITCH lever to the ON position. Then carefully place the tone arm on the record.

NOTE: If the record support arm is left in the raised position to the right, the changer will not shut off and the record will be played over. If the support arm is in its normal lowered position, the changer will shut off automatically after the record has been played.

PLAYING 45 RPM RECORDS

Refer to Figure 3 and the following steps to install the 45 rpm Adapter on the spindle and to play 45 rpm records.

1. Hold the adapter in front of the spindle and about 1-1/4" above the turntable.

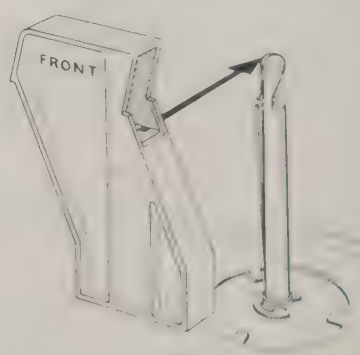


Figure 3

2. Move the adapter backward until the spindle enters the slot on the back of the adapter; then press the adapter down on the spindle as far as it will go.

3. Release the tone arm from its locked-down position on the rest post.

4. Place up to six records on the adapter. Hold the records level and lower the record support arm onto the records.

5. Slide the RECORD SPEED lever to the 45 position and the RECORD SIZE lever to the 7 position.

6. After the records have been played, remove the 45 rpm adapter before taking the records off the turntable. The adapter may be stored in the space below the changer shelf when not being used.

SECURING THE CHANGER

If the Record Player is to be transported any distance, it may be wise to securely anchor the record changer to the changer shelf as described in the following steps. Refer to Figure 4.

1. Press down on the edge of the changer. While holding the changer down, turn mounting screws BB and CC counterclockwise with a phillips screwdriver until the changer base is drawn down against the top of the changer shelf.

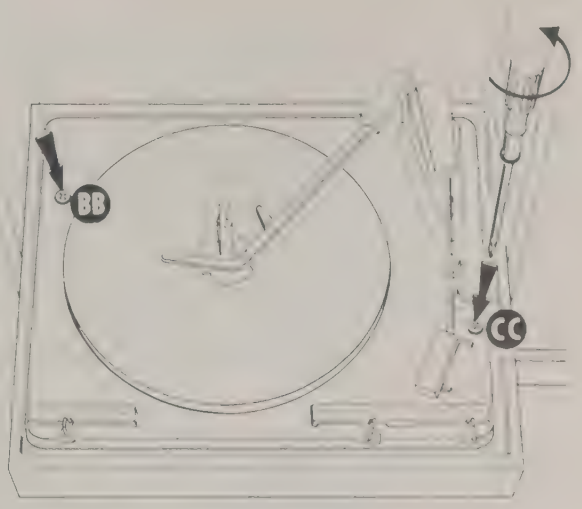


Figure 4

2. Before using the Record Player again, "refloat" the changer by turning mounting screws BB and CC clockwise until they are level with the top of the changer base.

IN CASE OF DIFFICULTY

The In Case Of Difficulty section of the Manual is divided into the following parts: Hum Test, General Tests, and the Record Changer and Amplifier Troubleshooting Charts. If your difficulty has to do with the changer not working properly, refer directly to the Record Changer Troubleshooting Chart. If the changer works properly, but there is improper sound or no sound from the speaker, refer to the Hum Test. The General Test will generally be used after the Hum Test is completed, or if the 120 VAC power does not seem to be reaching the changer motor.

HUM TEST

Perform the following "hum test" to determine the faulty section of the Record Player.

1. Turn the VOLUME control to the center of its rotation.

2. Turn the BALANCE control fully counter-clockwise.

3. Unplug the left channel phono plug from the changer. You will have to position the two flip-nuts in the in-line position and raise the front part of the changer to reach these phono plugs. See Figure 5.

4. Touch the end of the plug with your finger. A loud hum should be heard from the left speaker.

5. Reinstall the phono plug in the socket.

6. Unplug the right channel phono plug.

7. Turn the BALANCE control fully clockwise.

8. Touch the end of the phono plug. A loud hum should be heard from the right speaker.

9. The presence of this hum indicates that the trouble is in the record changer. If no hum is produced, the difficulty is in the amplifier.

NOTE: If factory service is required, return only the defective section, either the circuit board and speakers, or the record changer. Refer to the service section of the Kit Builders Guide for service and warranty information.

GENERAL TESTS

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the builder.

2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure they are soldered as described in the Soldering section of the Kit Builders Guide.

3. Check to be sure that all transistors are in their proper locations. Make sure each transistor lead is connected to the proper point.

4. Check the value of the parts. Be sure the proper parts have been wired into each circuit as shown in the Pictorial Diagrams. It would be easy, for example, to install a 22 Ω (red-red-black) resistor where a 220 KΩ (red-red-yellow) resistor should have been installed.

5. Refer to the Hum Test to help you determine the section of the Record Player that is causing the difficulty.

6. If the trouble still is not located and a voltmeter is available, check the voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input VTVM. Voltages may vary as much as ±10% due to line voltage variations.

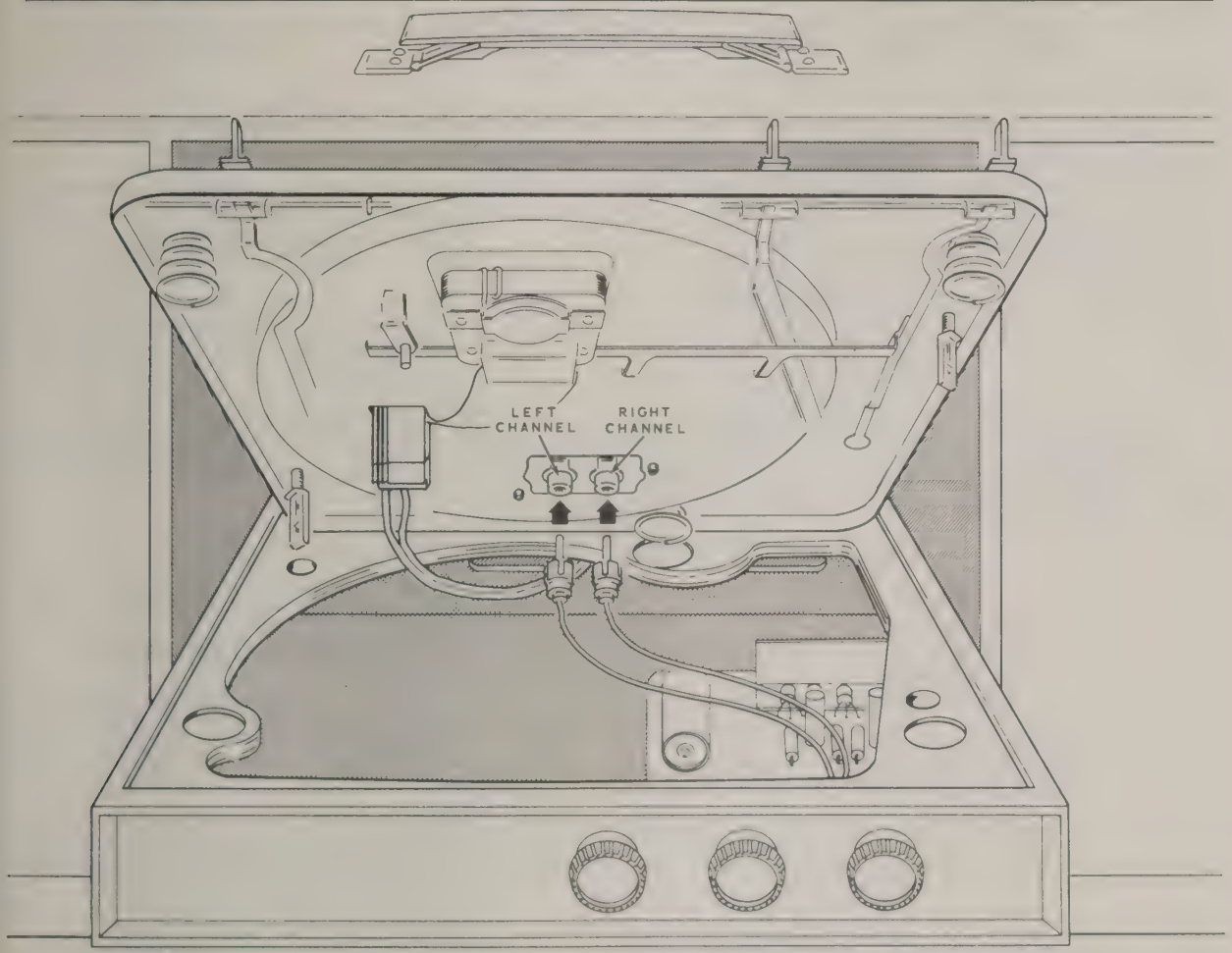


Figure 5

Refer to the Circuit Board X-Ray View on Page 32 and to the Changer Parts drawings (fold-out from Page 29) for the physical location of parts.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide", and to the "Factory Repair Service" information on Page 35 of this Manual.

Troubleshooting Charts

NOTE: The numbers in parentheses are keyed to the numbers on Figures 10 and 11 (fold-out from Page 29).

RECORD CHANGER

SYMPTOM	CAUSE	REMEDY
Turntable speed too slow. NOTE: Also refer to the first Amplifier Difficulty on Page 24.	1. Idler wheel height improperly adjusted.	Move Record Speed lever to the 33 position. Adjust screw (5) and center the idler pulley within the 33 rpm drive area of the motor shaft.
	2. Idler wheel not level.	With the Record Speed lever set at 33, sight over the baseplate and adjust the level by springing the yoke shaft (1). Readjust the idler for proper height.
	3. Idler wheel slipping.	See "Turntable Stalls, etc."
Turntable stalls or slows down during change cycle.	1. Dirty idler wheel tire, motor pulley, or turntable rim.	Wipe all surfaces with a clean dry cloth, or with alcohol.
	2. Idler tension spring weak.	Replace the drive spring (100).
	3. Yoke movement restricted.	Spring tab on yoke (4) is away from the angular surface on the disengage lever (74).
	4. Tight turntable bearing.	Clean the bearing post and relubricate it with #90 oil.
Changer does not shut-off after last record has played.	1. Record support not dropping freely.	Clean the support arm shaft (58) and oil it lightly. Work the support arm up and down until it moves freely.
	2. Shut-off tab on control arm (78) not entering slot between detent lever and delay arm (57).	Check the detent lever (57) and selector lever (75) for binding. See that the tip of the delay arm spring (57) catches the tab on the control arm (78) to allow it to enter the gap.
	3. Shut-off lever spring (87) weak or missing.	Replace the shut-off lever spring (87).
	4. Lock lever (88) binding.	Check for freeness of movement at the rivet.
	5. Control arm (78) binding.	Check for parts being straight and free at the rivet.
Tone arm does not return to rest post after shut-off.	1. Lock lever (88) does not engage index plate (92) at rest post.	If the lock lever hits underneath the index plate, twist the stabilizer guide assembly slightly to allow the lever to latch properly. If the lock lever fails to move into engagement with the index plate, check the symptoms "Changer does not shut-off after last record".
Will not play last record.	1. Defective detent lever assembly (57).	Check the gap between the detent lever (57) and the delay arm. If the gap is wider than the shut-off tab on the control arm (78), bend the delay spring (mounted on the detent lever) or replace the assembly.
	2. Record support not holding record stack level.	Straighten the record support arm (54).

SYMPTOM	CAUSE	REMEDY
Tone arm does not track record.	1. Needle broken.	Check and replace the needle if it is worn or broken.
	2. Needle clogged with lint.	Clean the needle carefully.
	3. Not enough needle pressure.	Pickup wires binding. Allow a small amount of slack where these wires come up through the hole in the false hinge (45). Readjust the needle pressure by moving the spring hook (46) one hole toward rear of pickup arm.
	4. Friction in tone arm (47).	Make sure the lock lever is not dragging on the index plate (92). Check the trip link (83) for binding. Replace the trip link if necessary.
	5. Clutch pad dragging on index plate (92).	Bend the clutch spring on the cam arm (80) upward slightly to clear the index plate.
No center trip.	1. Gear (34) not detenting properly.	Check for binding of the detent lever (57), selector lever (75), or ejector link (81). Check the cam arm (80) for freeness to rotate. Replace the detent spring (76) if weak.
	2. Trip link (83) not engaging trip pawl (33).	Trip link bent. Replace.
	3. Excessive tone arm friction.	See "Tone arm does not track record".
	4. Trip pawl bounces (intermittent failure).	Add a drop of heavy oil between the pawl elements (3).
Tone arm will not lower to record.	1. Lift pin binding.	Check for straightness and burrs. Replace or remove burrs.
	2. Insufficient cam arm (80) travel.	See item #2 under "Won't drop records".
	3. Pickup leads binding.	See item #3 under "Tone arm does not track record".
Can't adjust set-down.	1. Binding selector lever (75) or detent lever (57).	Check for freeness of motion of levers. If they are binding, remove the bind or replace the faulty part.
Noise during playing of record.	1. Defective turntable bearings.	Check to make sure the bearing washer (35) and bearing retainer (36) are installed.
	2. Thumping idler wheel.	If the thumping persists after the wheel has been running for some time, the idler wheel has developed a flat and should be replaced.
Tone arm will not cycle properly.	1. Insufficient clutch tension.	If the clutch spring on the cam arm (80) is broken or bent, replace it. Clean the clutch pad and index plate (92) with alcohol. If the condition persists, bend the tip of the spring that has the pad downward slightly for more tension.
	2. Tone arm catching on rest post.	Raise the tone arm by adjusting the height screw.
	3. Trip link binding.	If the trip link is bent, replace it.

SYMPTOM	CAUSE	REMEDY
Will not change speeds.	1. Drive spring weak or missing.	Replace the drive spring (100).
	2. Idler wheel not level.	See item #2 under "Turntable speed too slow".
	3. Yoke assembly (4) does not slide freely on yoke shaft (1).	Remove bind or replace defective part.
Will not drop records.	1. Spindle (31) not seated properly.	Make sure the spindle is locked in position and held by the clamp spring (68).
	2. Center spindle pusher (31) not making complete travel.	Check the spindle for a bent pusher. Straighten the pusher or replace the spindle.
		Cam arm (80) not making complete travel.
		The cam arm, in the detent position, should allow the lift pin (86) to come to the bottom of the lift ramp. If not, check the tightness of the nut (51) and staking on the actuator assembly (79).
	3. Pusher not engaging hole in record.	The bias spring on the ejector link assembly (81) should have more upward force. Remove the link and bend the spring slightly.

AMPLIFIER

DIFFICULTY	POSSIBLE CAUSE
Turntable speed too slow. No sound.	1. Matched pair of transistors Q3, Q4 or Q7, Q8 improperly installed or shorted. First check the transistors for proper installation. 2. Remove Q3 and Q4; then check the turntable speed. If the speed is normal, the transistors are faulty and should be replaced with a new matched pair. If the speed is still too slow, the transistors are OK. Reinstall them on the circuit board. Then proceed to the next step. 3. Remove Q7 and Q8 and repeat the same procedure as you did with Q3, Q4.
No sound from either speaker.	1. Diode D1 defective. 2. Capacitor C13 shorted. 3. Red wire between changer and circuit board broken. 4. Shielded cables between changer and circuit board shorted or unplugged. 5. Changer motor defective. 6. Cartridge defective or not wired correctly.

DIFFICULTY	POSSIBLE CAUSE
Excessive hum from both speakers.	1. Reverse line cord in wall outlet. 2. Terminal strip lug improperly grounded to changer (this is the lug with the black wire attached). 3. Capacitor C13 open. 4. Red and black wires to terminal strip on changer reversed.
Weak or distorted sound from left speaker. Right speaker ok.	1. Transistor Q3 or Q4 improperly installed. 2. Transistor Q1, Q2, Q3, or Q4 defective. 3. Left speaker defective. 4. Capacitor C6 shorted or open. 5. Broken shield lead of left channel shielded cable at changer or circuit board. 6. Broken wire to cartridge. 7. Defective cartridge or needle.
Weak or distorted sound from right speaker. Left speaker ok.	1. Transistor Q7 or Q8 improperly installed. 2. Transistors Q5, Q6, Q7, or Q8 defective. 3. Right speaker defective. 4. Capacitor C12 shorted or open. 5. Broken shield lead of right channel shielded cable at changer or circuit board. 6. Broken wire to cartridge. 7. Defective cartridge or needle.
Weak or distorted sound from both speakers.	1. Bent cartridge needle. 2. Diode D1 or capacitor C13 defective. 3. Transistor Q1, Q2, Q3, Q4, Q5, Q6, Q7, or Q8 defective. 4. Speakers defective. 5. Broken shield leads of both shielded cables at changer or circuit board.
Left and right channels reversed.	1. Left and right channel phono plugs reversed. 2. Cartridge wired incorrectly.
Low or no power supply voltage at diode D1.	1. Diode D1 improperly installed. 2. Red wire between changer and circuit board broken. 3. Capacitor C13 shorted. 4. Changer motor defective.

MAINTENANCE

CARTRIDGE AND NEEDLE REPLACEMENT

The Sonotone 61T-SD ceramic cartridge, which is installed in the record changer, is equipped with a diamond and sapphire dual needle. A dual-sapphire needle is also available for this cartridge, and is listed in the Record Changer Replacement Parts List on Page 28. The following information will help you to replace either the needle or the cartridge.

Needle Replacement

To remove a needle from the cartridge, turn the needle selector arm to a point midway between the two playing positions. Then pull forward and downward on the selector arm.

To replace a needle, position the needle with the selector arm downward as shown in Figure 6. Hold the needle by the selector arm and slip the back of the needle under the clip on the cartridge. The tip of the needle should seat itself properly as you turn the selector arm to either playing position.

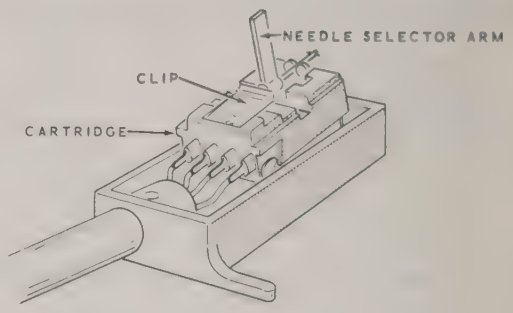


Figure 6

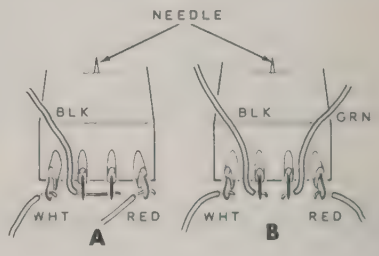


Figure 7

Cartridge Replacement

The cartridge in your record changer tone arm may be wired in either of the two ways shown in Figure 7. Observe how your cartridge is wired before you remove it from the arm. Then be sure you wire the replacement cartridge in the same way. The Sonotone 61T-SD cartridge can be removed and replaced without any tools.

To remove the cartridge, turn the needle selector arm to a point midway between the two playing positions as shown in Figure 8. Hold the selector arm between the thumb and forefinger of one hand. With the thumbnail of your other hand, pull the front tab away from the cartridge. Then pull the cartridge out of the bracket and remove the clips from the cartridge terminals.

Cartridge replacement is a reverse of the removal instructions. First, attach the clips to the proper cartridge terminals. Then slip the key at the rear of the cartridge into the slot at the rear of the bracket. Press the cartridge until it locks into the front tab.

NOTE: If it becomes necessary to resolder any of the wires to the clips, first remove the clip from its terminal. Excessive heat applied to a terminal could damage the cartridge.

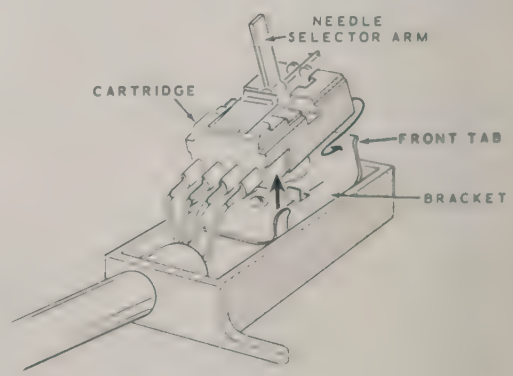


Figure 8

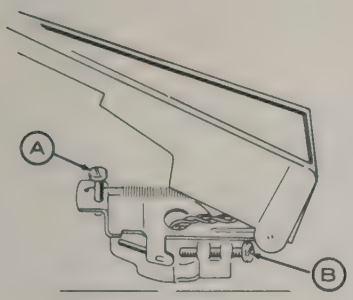


Figure 9

CHANGER ADJUSTMENTS

Refer to Figure 9 for the location of the following adjustment points.

Tone Arm Height

Lift the tone arm as shown in Figure 9. Turn adjusting screw A counterclockwise to raise the arm, or clockwise to lower the arm.

Needle Set Down

Turn adjusting screw B (under the rear of the tone arm) clockwise to move the needle landing point inward, or counterclockwise to move the landing point outward.

LUBRICATION

NOTE: The numbers in parentheses are keyed to the numbers on Figures 10 and 11 (fold-out from Page 29).

This changer has been lubricated for lifetime operation. If the changer has had extreme usage, or if parts are replaced, lubricate as follows:

Apply A General Purpose Grease To:

1. Yoke shaft (1).
2. Gear shaft (34).
3. Turntable bearing retainer (36).
4. Edges of slot in actuator arm (52).
5. Edge of detent lever (57) that engages gear detent pin.
6. Edges of shift lever (71) that engages tab of idler yoke (4).
7. Pin of selector (75).
8. Edge of control arm assembly (78) that engages disengage lever (74). Also edge that rides in the slot of the baseplate.
9. Edge of cam arm assembly (80) that rides in slot on tone arm housing. Also lift pin (86) cam surface.
10. Edges of slot in ejector link assembly (81).
11. Control slider shafts (21) (60).
12. Pin (85) cam surface on baseplate.
13. Lift pin assembly (86).
14. Detent notches in baseplate that engage shift lever (71).

Apply #90 Oil To:

1. Support arm shaft (58).
2. Actuator lever shaft (79).
3. Turntable bearing (36).

CAUTION: Avoid over oiling. One or two drops is all that is required.

RECORD CHANGER CHANGE CYCLE

NOTE: The following description of the change cycle is furnished to you in case maintenance should be necessary at some future date. The numbers in parentheses are keyed to the numbers on Figures 10 and 11 (fold-out from Page 29).

The change cycle is started when the stylus traverses the lead-in groove at the center of the record or when the reject lever is operated, causing the trip pawl to engage the projection on the turntable hub. As the gear assembly rotates counterclockwise, the pin leaves the notch of the detent lever assembly, but the detent lever is held in place by the cutout flange near the rim of the gear assembly.

The drive pin in the upper side of the gear assembly moves the actuator arm (52) clockwise around the shaft, which projects through the baseplate; and at the same time, it moves the actuator lever assembly (79) and cam arm assembly (80) on the other end of the shaft. These last two parts can move separately, but at this point of the cycle they move together because of the action of the cam arm spring (91).

As the cam arm assembly (80) rotates, the lift pin (86) rides up a ramp on the cam arm assembly and raises the pickup arm. At the same time, a pin in the cam arm assembly is forced down by a depressed sector of the turntable baseplate, pushing a clutch spring and pad down against the upper surface of the index plate (92). The clutch spring and pad are part of the cam arm assembly and move with it, thus tending to rotate the index plate and pickup arm.

During the first 180 degrees of rotation of the gear assembly, the actuator arm (52) is being driven clockwise, moving the index plate (92) and the pickup arm towards the rest post (96). If the cycle has started at the end of play, the pickup arm will lift and move to the rest post. If the cycle starts with the pickup arm already at rest, the clutch pad will merely slip on the index plate and the pickup arm will not move. At approximately 100 degrees of rotation of the gear assembly, the cam arm assembly (80) is halted by the mounting post of the selector lever assembly (75), and further rotation forces the actuator lever assembly (79) to work against the cam arm spring (91). As the actuator lever assembly rotates, it pushes the ejector link assembly (81) against the bottom end of the ejector lever in the spindle assembly (31). The top end of the ejector lever moves over and pushes the bottom record off the stack allowing it to drop to the turntable.

During the second 180 degrees of rotation of the gear assembly, actuator arm (52) is driven counterclockwise. The action of the clutch pad on the index plate (92) moves the pickup arm out over the record. The set-down point for 7, 10, or 12 inch records is determined by the indexing pin on the end of the selector lever (75). The setting of the selector lever allows the index pin to contact the proper step on the index plate (92). When this point is reached, the index plate and pickup arm are halted, and further rotation of the actuator arm merely causes the clutch pad to slip on the index plate.

At the last part of the cycle, the inclined ramp on the cam arm assembly (80) reaches the lift pin and lowers the pickup arm onto the record. The gear assembly reaches the zero position again and the turntable hub gear is automatically disengaged from the gear assembly by the vacant space on the rim of the gear assembly.

Automatic shut-off at the end of the last record is initiated by the record support arm, which drops down with the last record. The bent portion of the support arm shaft (58) contacts a linkage on the guide assembly (88), which in turn pulls the shut-off link (90), pulling part of the control arm assembly towards the rear of the changer unit. A projection of the control arm assembly is brought into position to drop into the shut-off notch in the detent lever assembly (57), and the last few degrees of rotation of the gear assembly forces the detent lever and control arm back, shutting off the switch.

RECORD CHANGER REPLACEMENT PARTS LIST

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

NOTE: The complete Record Changer including the cartridge and needles, 45 RPM adapter, and line cord assembly is listed as Heathkit Part #415-22.

MECHANICAL PARTS

These parts are identified by their different 233- part numbers on Figures 10 and 11. Number 233-4, for instance, is identified by the circled number 4 on Figure 10.

PART No.	DESCRIPTION
233-1	Yoke shaft
233-100	Drive spring
233-3	Bowed retaining ring
233-4	Yoke
233-5	Idler screw
233-6	Idler arm assembly
233-7	Switch shield

PART No.	DESCRIPTION
233-8	Switch
233-9	Self-tapping screw
233-10	Wire and contact assembly
233-11	Connector block
233-12	Control knob
233-13	Control slider
233-14	Self-tapping screw
233-15	L.H. control housing assembly
233-16	Retaining ring
233-17	Fiber washer
233-18	Idler wheel
233-19	Screw
233-20	Lug and contact assembly
233-21	Pin
233-22	Linkage fastener
233-23	Shield plate
233-24	Spacer
233-25	Spacer
233-99	Motor and terminal assembly
233-27	Retaining ring
233-28	Turntable insert
233-29	Turntable mat
233-30	Turntable assembly
233-31	Spindle assembly
233-32	Retaining ring
233-33	Trip pawl assembly
233-34	Gear assembly
233-35	Bearing washer
233-36	Bearing retainer
233-37	Rubber washer
233-38	Baseplate assembly
233-39	Retaining ring
233-40	Pickup arm assembly
233-41	Knurled pin
233-42	Pickup cable assembly
233-43	Lug
233-44	Machine screw
233-45	False hinge
233-46	Counterbalance spring
233-47	Shaft and hinge assembly
233-48	Safety spring
233-49	Compression spring
233-50	Hinge pin
233-51	Hex nut
233-52	Actuator arm
233-53	Detent lever spring
233-54	Record support arm
233-55	Housing
233-56	Shoulder screw
233-57	Detent lever assembly
233-58	Support arm shaft
233-59	R.H. control housing assembly
233-60	Pin
233-61	Self-tapping screw
233-62	Machine screw
233-63	Teflon washer
233-64	Setscrew
233-65	Support arm shaft spring
233-66	Nut
233-67	Mounting bolt
233-68	Clamp spring
233-69	Dampener
233-70	Mounting clip
233-71	Shift lever
233-72	Shoulder screw
233-73	Compression spring
233-74	Disengage lever
233-75	Selector lever assembly
233-76	Detent spring
233-77	Reject spring
233-78	Control arm assembly
233-79	Actuator lever assembly
233-80	Cam arm assembly
233-81	Ejector link assembly
233-82	Bowed retaining ring
233-83	Trip link
233-84	Retaining ring
233-85	Cam arm pin
233-86	Lift pin
233-87	Shut-off lever spring
233-88	Support arm shaft guide assembly
233-89	Self-tapping screw
233-90	Shut-off link
233-91	Cam arm spring
233-92	Index plate
233-93	Hex nut
233-94	Washer
233-95	Spacer
233-96	Rest post
233-97	Grommet
233-98	45 rpm adapter
250-8	Screw
434-82	Phono socket
431-16	Terminal strip

CARTRIDGE AND NEEDLE

425-78	Sonotone 61T-SD ceramic cartridge with C-41517-2 diamond and sapphire needle
89-32	Line cord with connector

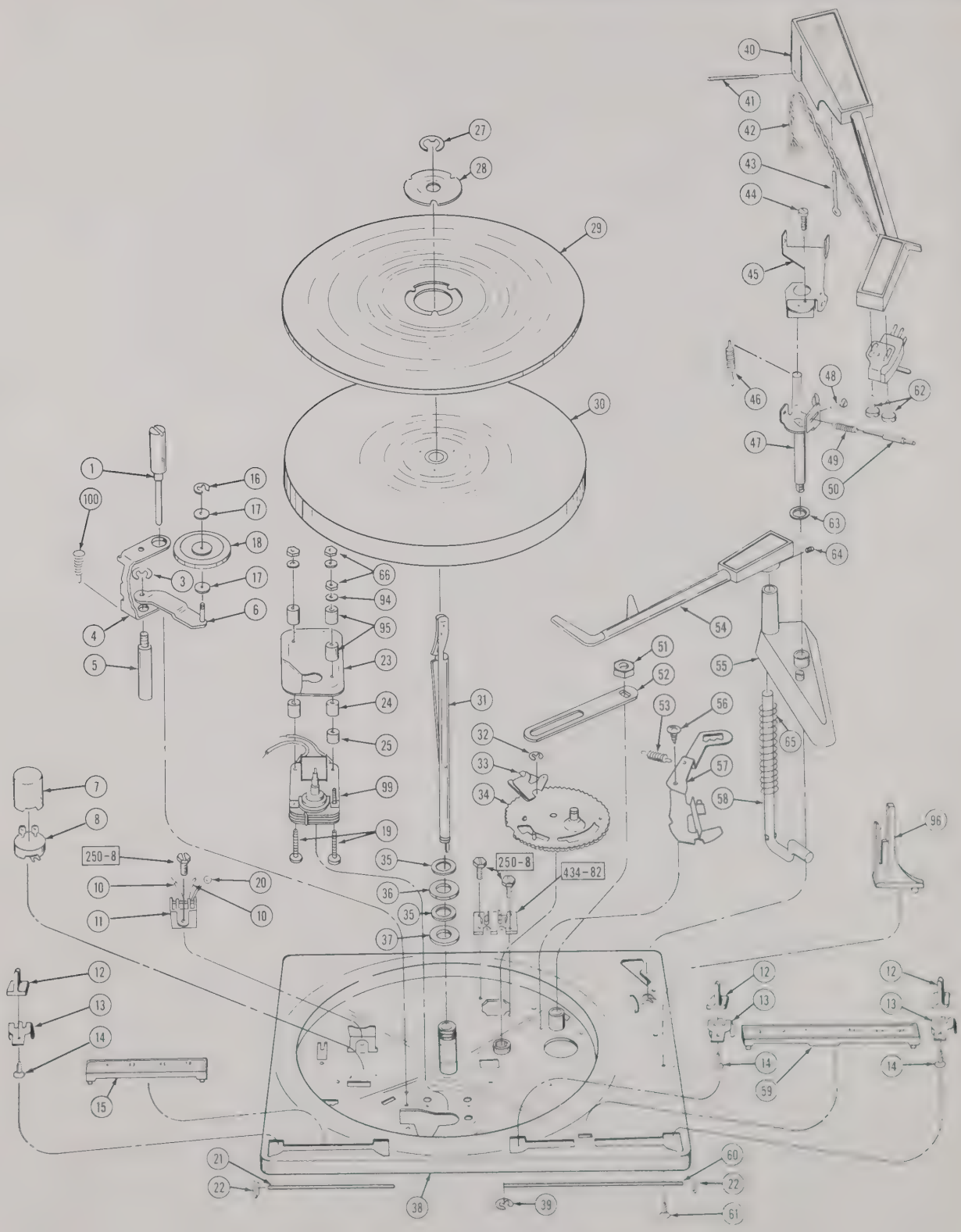

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FIGURE 10

EMENT PARTS PICTORIAL

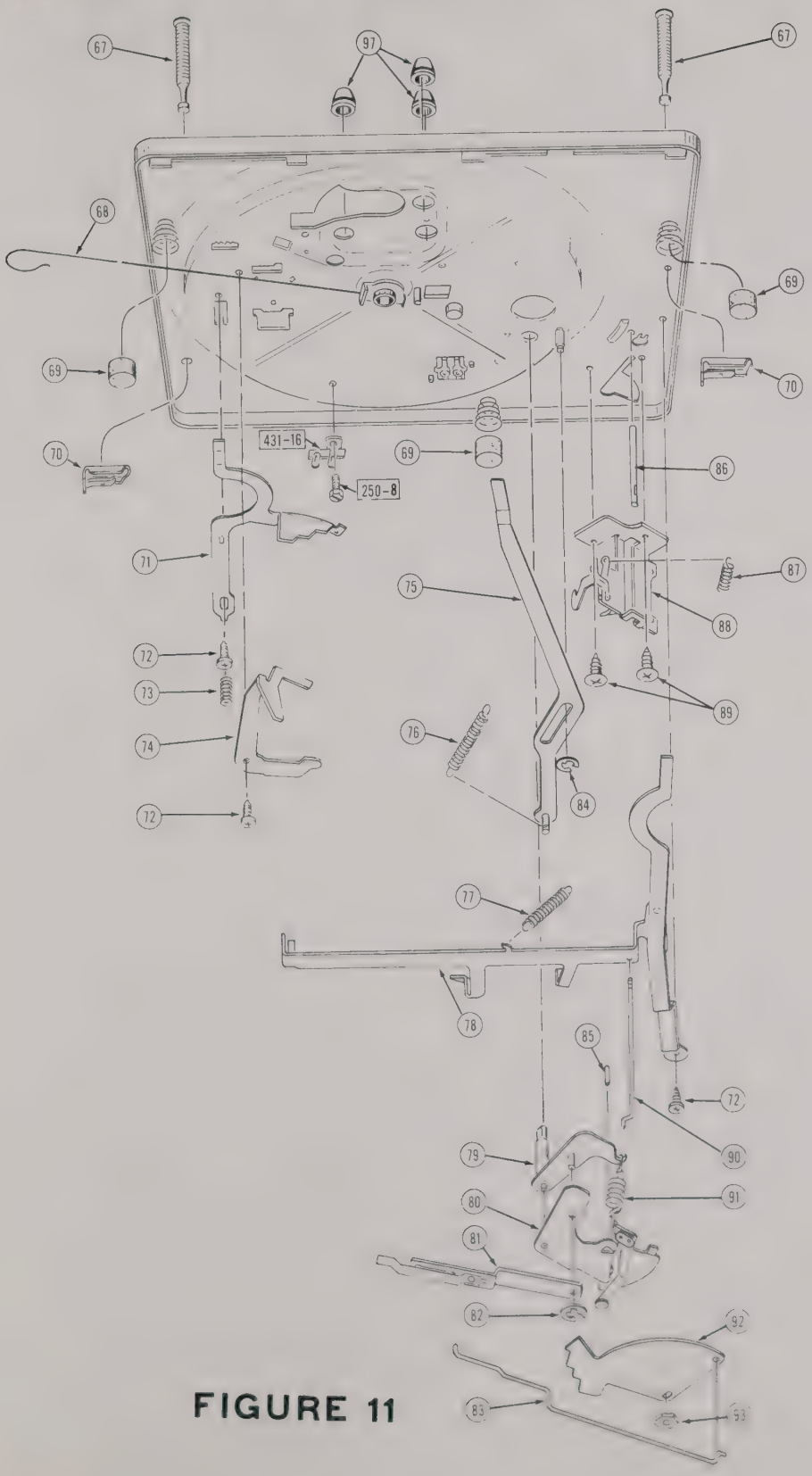
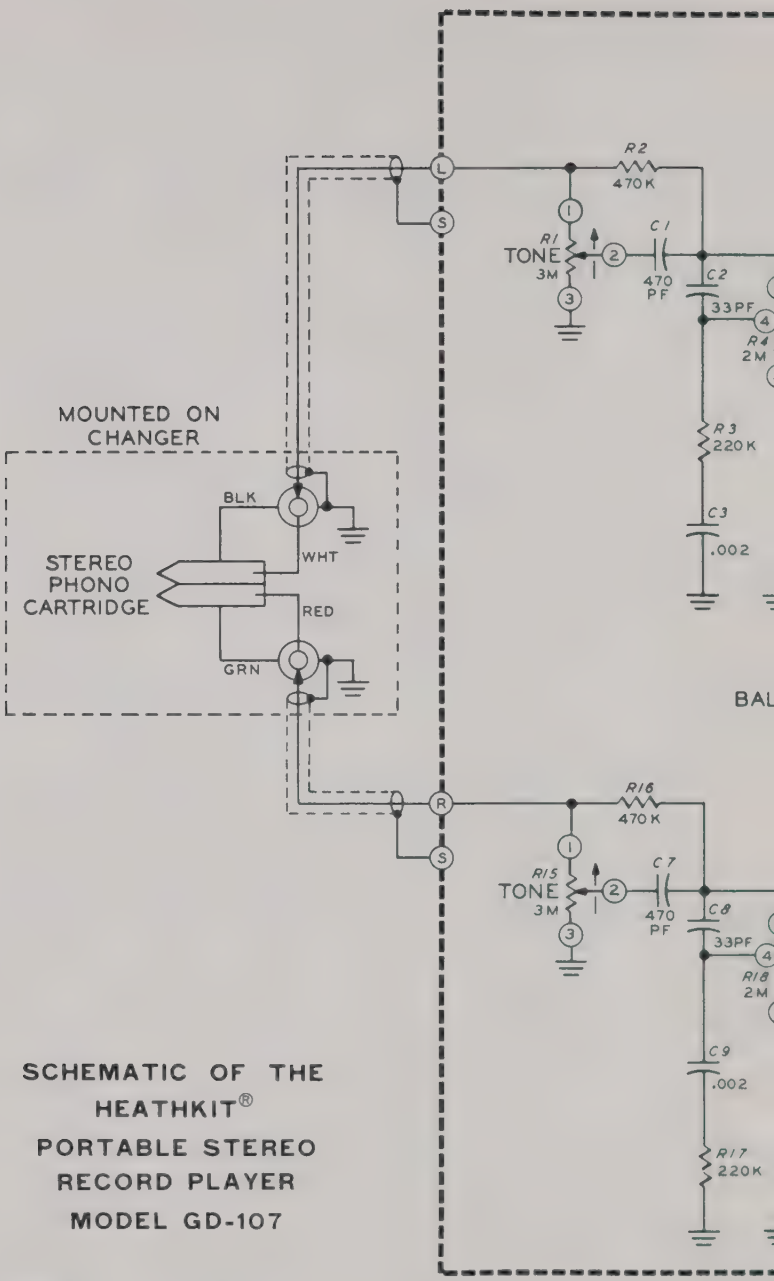


FIGURE 11



SCHEMATIC OF THE HEATHKIT® PORTABLE STEREO RECORD PLAYER MODEL GD-107

NOTES:

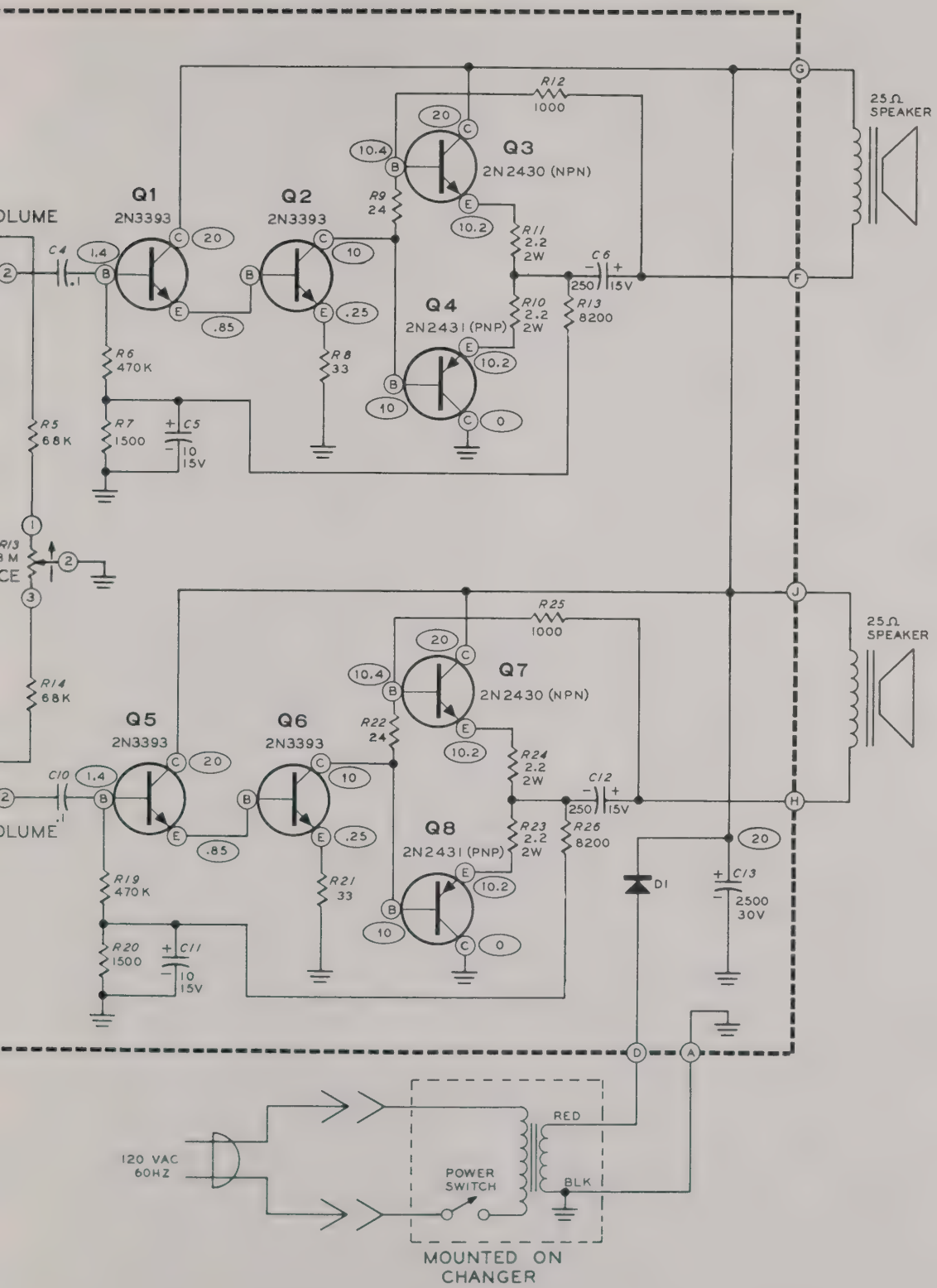
ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE. RESISTOR VALUES ARE IN OHMS (K = 1000, M = 1,000,000).

ALL CAPACITOR VALUES ARE IN μfd UNLESS MARKED OTHERWISE.

⬭ THIS SYMBOL INDICATES A POSITIVE DC VOLTAGE MEASUREMENT, TAKEN WITH AN 11 MEGOHM VTVM, FROM THE POINT INDICATED TO THE COLLECTOR (C) OF TRANSISTOR Q4 OR Q8. THIS IS THE GROUND FOIL OF THE CIRCUIT BOARD. VOLTAGE MAY VARY ±10%.

4. VOLTAGES TAKEN WITH NO INPUT SIGNAL.

ARROW INDICATES CLOCKWISE ROTATION OF CONTROL.


Q1
2N3393
Q2
2N3393
Q3
2N2430 (NPN)
Q4
2N2431 (PNP)
Q5
2N3393
Q6
2N3393
Q7
2N2430 (NPN)
Q8
2N2431 (PNP)
R12
1000
R9
24
R11
2.2
2W
R10
2.2
2W
R13
8200
C6
250
15V
R6
470K
R7
1500
C5
10
15V
R8
33
R5
68K
R14
68K
R25
1000
R22
24
R24
2.2
2W
R23
2.2
2W
R26
8200
C12
250
15V
R19
470K
R20
1500
C11
10
15V
R21
33
D1
C13
2500
30V
25Ω
SPEAKER
25Ω
SPEAKER
120 VAC
60HZ
POWER
SWITCH
RED
BLK
MOUNTED ON
CHANGER

SPECIFICATIONS

AMPLIFIER

Frequency Response	±5 db from 100 Hz to 10 kHz.
Phono Equalization	RIAA (Record Industry Association of America).
Music Power Output	3 watts (1-1/2 watts per channel).*
Controls	Volume, Tone, and Balance.
Speakers	2 - PM, 4" x 6", 25 Ω voice coil.
Transistor And Diode Complement	4 - 2N3393. 2 - 2N2430. 2 - 2N2431. NOTE: The 2N2430 and the 2N2431 are matched pairs. 1 - Silicon diode.

CHANGER

Type	Maestro Model 52-93.
Turntable Speeds	16, 33, 45, and 78 rpm.
Record Size	12", 10", or 7".
Cartridge Type	Ceramic stereo cartridge.
Stylus	Diamond sapphire; .7 mil diamond for LP records, 3 mil sapphire for 78 rpm records.

GENERAL

Power Requirements	105-125 volts, 60 Hz AC, 15 watts.
Net Weight	21 lbs.

*Rated EIA (Electronic Industries Association) standards.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 30) while reading this Circuit Description.

This Record Player is composed of three sections: The Maestro Model 52-93 record changer and turntable mechanism, the ceramic stereo pickup cartridge, and the amplifiers and speakers. Identification drawings that identify the various parts of the record changer are provided on the fold-out from Page 29 of this Manual. The all-transistor amplifier is described below.

AMPLIFIER

The complete amplifier section of the Record Changer consists of a left channel amplifier and a right channel amplifier. These amplifiers are identical; therefore, to simplify this description, only the left channel amplifier is described.

The input signal from the stereo cartridge is applied directly to the Tone control, and through the tone control network to the Volume control. When the Tone control is in the full clockwise position (at lug 1), the input signal is coupled through capacitor C1 and resistor R2 to the Volume control, and maximum high frequency response is obtained. When the Tone control is in the full counterclockwise position (at lug 3), the input signal is coupled to the Volume control through R2 only, and capacitor C1, which is now connected from the top of the Volume control to ground, attenuates the high frequencies.

The Balance control adjusts the amount of signal supplied to the left and right amplifiers. When the control is in the full clockwise position (at lug 1), most of the left amplifier signal is bypassed through resistor R5 to ground, resulting in less signal strength at transistor Q1. When the control is in the fully counterclockwise position (at lug 3), most of the right amplifier signal is bypassed through resistor R14 to ground, resulting in less signal strength at transistor Q5.

Capacitors C2 and C3, and resistor R3 form a loudness compensating network for the Volume control. This network accents both the high and low frequencies at low volume settings.

From the arm of the Volume control, the input signal is coupled through capacitor C4 to the base of transistor Q1, which is connected as an emitter follower. From the emitter of Q1, the signal is direct-coupled to the base of amplifier transistor Q2.

Resistors R13 and R7, which are connected as a voltage divider from the emitter circuit of the output stage to ground, provide base bias for transistor Q1 through resistor R6. Capacitor C5 bypasses R7 to prevent audio output signals from being coupled back into the base of Q1.

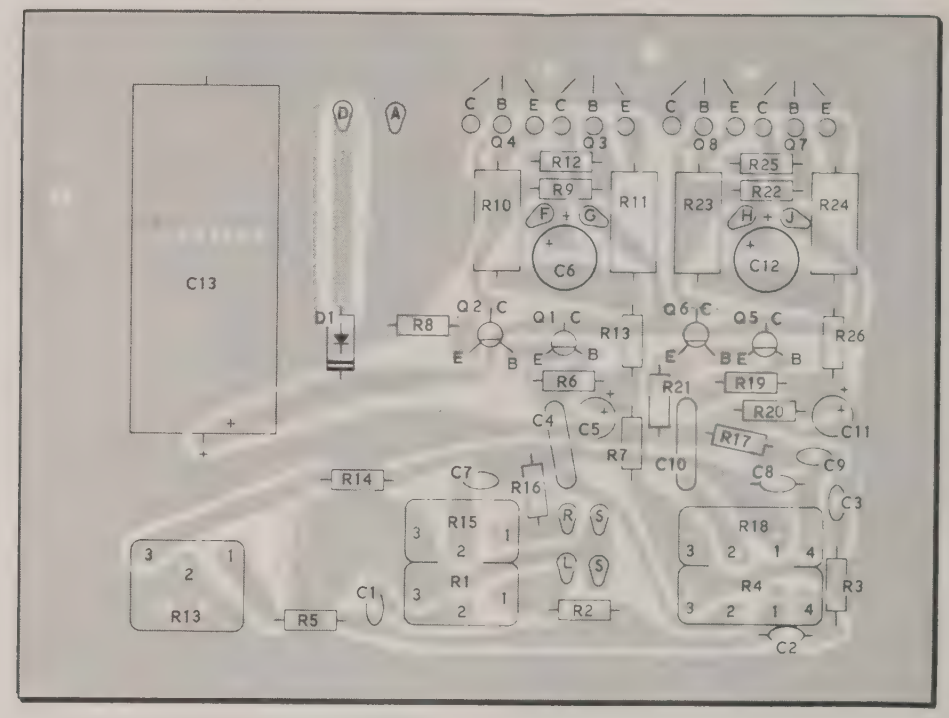
The amplified signal from the collector of Q2 is coupled directly to the base of transistor Q4, and through isolation resistor R9 to the base of Q3. These two transistors are connected in a complementary symmetry output circuit. In this circuit, a PNP transistor (Q4) and an NPN transistor (Q3) are connected in a Class B emitter-follower configuration. Resistors R9 and R12 form the collector load for driver transistor Q2. These resistors are also part of the bias network for output transistors Q3 and Q4.

A negative-going AC signal at the base of the output transistors will cause Q4 to conduct, thereby charging capacitor C6 through the voice coil of the speaker. When the signal goes in the positive direction, Q3 will conduct and discharge capacitor C6 back through the voice coil.

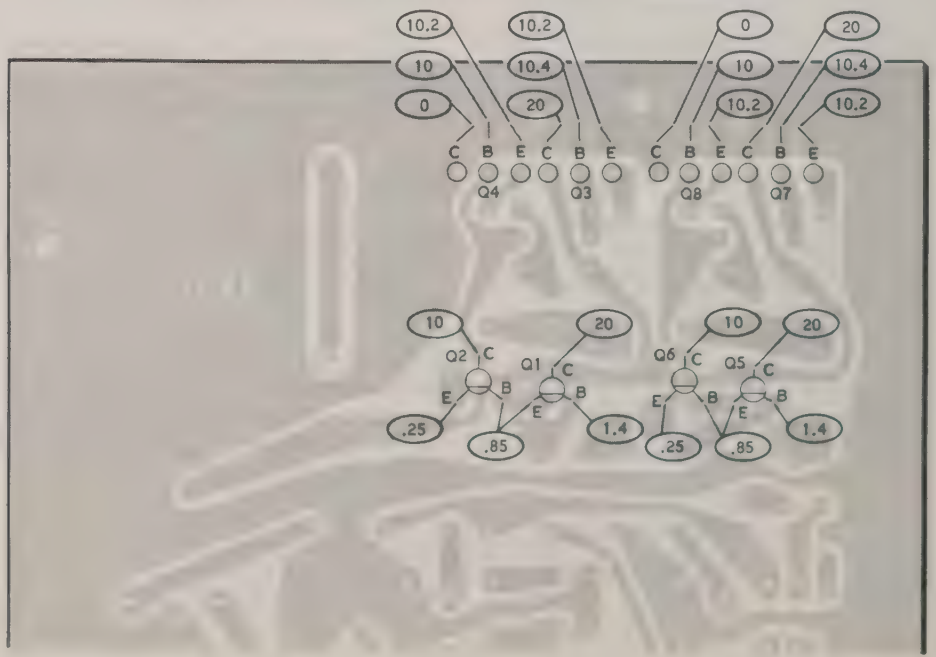
POWER SUPPLY

AC line voltage is supplied through the Power Switch to the changer motor. The secondary winding of the changer motor isolates the amplifiers from the AC line and steps down the line voltage. This voltage is rectified by diode D1, filtered by capacitor C13, and supplied to the amplifiers.

CIRCUIT BOARD X-RAY VIEW
(VIEWED FROM COMPONENT SIDE)



CIRCUIT BOARD VOLTAGES



REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1/2 Watt		
1-155	.10	24 Ω
1-103	.10	33 Ω
1-9	.10	1000 Ω
1-81	.15	1500 Ω
1-114	.10	8200 Ω
1-60	.10	68 KΩ
1-29	.10	220 KΩ
1-33	.10	470 KΩ
2 Watt		
3-5-2	.15	2.2 Ω wire-wound
CAPACITORS		
Disc		
21-7	.10	33 pf
21-56	.10	470 pf
21-36	.10	.002 μfd
Resin		
27-47	.20	.1 μfd
Electrolytic		
25-115	.45	10 μfd
25-160	.55	250 μfd
25-154	1.65	2500 μfd
CONTROLS		
10-217	.65	3 megohm control (Balance)
12-82	1.05	3 megohm dual control (Tone)
12-81	1.50	2 megohm dual control (Volume)
DIODE-TRANSISTORS		
57-27	.60	Silicon diode
417-118	.55	2N3393 transistor
117-6	2.05	Matched pair of transistors, consisting of one 2N2430 NPN transistor (#417-121) and one 2N2431 PNP transistor (#417-122).

PART No.	PRICE Each	DESCRIPTION
WIRE-CABLE-SLEEVING		
344-15	.05/ft	Black stranded wire
344-16	.05/ft	Red stranded wire
343-7	.05/ft	Shielded cable
346-7	.10/ft	Clear sleeving
HARDWARE		
250-4	.05	4-40 x 3/8" screw
254-9	.05	#4 lockwasher
252-2	.05	4-40 nut
250-8	.05	#6 x 3/8" sheet metal screw
252-3	.05	6-32 nut
254-1	.05	#6 lockwasher
432-66	.10	Terminal strip connector
438-4	.10	Phono plug
207-3	.10	Cable clamp
215-19	.10	Transistor heat sink
MISCELLANEOUS		
415-22	22.65	Record changer (Maestro Model 52-93) with Sonotone 61T-SD cartridge, 45 rpm adapter, and line cord
425-78	4.35	Sonotone 61T-SD ceramic cartridge with C-41517-2 diamond and sapphire needle
89-32	.40	Line cord with connector
85-175-2	2.15	Circuit board
91-154	16.20	Cabinet
204-781	.15	Transistor mounting bracket
261-28	.10	Plastic foot
391-39	.15	Heathkit nameplate
401-110	3.15	Speaker
462-200	.50	Knob
490-5	.10	Nut starter
331-6	.15	Solder
	2.00	Manual (See front cover for part number.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

RECORD CHANGER
REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

The following prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

PART No.	PRICE Each	DESCRIPTION
233-1	.30	Yoke shaft
233-100	.10	Drive spring
233-3	.05	Bowed retaining ring
233-4	.15	Yoke
233-5	.15	Idler screw
233-6	.25	Idler arm assembly
233-7	.45	Switch shield
233-8	1.20	Switch
233-9	.05	Self-tapping screw
233-10	.15	Wire and contact assembly
233-11	.40	Connector block
233-12	.20	Control knob
233-13	.10	Control slider
233-14	.05	Self-tapping screw
233-15	.60	L.H. control housing assembly
233-16	.05	Retaining ring
233-17	.05	Fiber washer
233-18	1.50	Idler wheel
233-19	.10	Screw
233-20	.50	Lug and contact assembly
233-21	.05	Pin
233-22	.05	Linkage fastener
233-23	.25	Shield plate
233-24	.10	Spacer
233-25	.10	Spacer
233-99	5.60	Motor and terminal assembly
233-27	.10	Retaining ring
233-28	.15	Turntable insert
233-29	1.05	Turntable mat
233-30	3.55	Turntable assembly
233-31	3.60	Spindle assembly
233-32	.05	Retaining ring
233-33	.30	Trip pawl assembly
233-34	.65	Gear assembly
233-35	.10	Bearing washer
233-36	.15	Bearing retainer
233-37	.10	Rubber washer
233-38	5.25	Baseplate assembly
233-39	.05	Retaining ring
233-40	1.10	Pickup arm assembly
233-41	.10	Knurled pin
233-42	1.50	Pickup cable assembly
233-43	.05	Lug
233-44	.05	Machine screw
233-45	.15	False hinge
233-46	.10	Counterbalance spring
233-47	1.20	Shaft and hinge assembly
233-48	.05	Safety spring
233-49	.05	Compression spring
233-50	.15	Hinge pin
233-51	.05	Hex nut
233-52	.15	Actuator arm
233-53	.10	Detent lever spring
233-54	1.00	Record support arm
233-55	.95	Housing
233-56	.10	Shoulder screw
233-57	.30	Detent lever assembly
233-58	.20	Support arm shaft
233-59	.45	R.H. control housing assembly
233-60	.10	Pin
233-61	.05	Self-tapping screw
233-62	.05	Machine screw
233-63	.10	Teflon washer
233-64	.10	Setscrew
233-65	.10	Support arm shaft spring
233-66	.05	Nut
233-67	.20	Mounting bolt
233-68	.05	Clamp spring
233-69	.05	Dampener
233-70	.10	Mounting clip
233-71	.25	Shift lever
233-72	.10	Shoulder screw
233-73	.05	Compression spring
233-74	.20	Disengage lever
233-75	.35	Selector lever assembly
233-76	.10	Detent spring
233-77	.10	Reject spring
233-78	.70	Control arm assembly

PART No.	PRICE Each	DESCRIPTION
233-79	.45	Actuator lever assembly
233-80	.55	Cam arm assembly
233-81	.25	Ejector link assembly
233-82	.10	Bowed retaining ring
233-83	.10	Trip link
233-84	.05	Retaining ring
233-85	.10	Cam arm pin
233-86	.10	Lift pin
233-87	.10	Shut-off lever spring
233-88	.90	Support arm shaft guide assembly
233-89	.05	Self-tapping screw
233-90	.05	Shut-off link
233-91	.10	Cam arm spring
233-92	.15	Index plate
233-93	.05	Hex nut
233-94	.05	Washer
233-95	.10	Spacer
233-96	.25	Rest post
233-97	.10	Grommet
233-98	.60	45 rpm adapter
250-8	.05	Screw
434-82	.10	Phono socket
431-16	.10	Terminal strip

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heath Authorized Service Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heath Authorized Service Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heath Authorized Service Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH COMPANY

BENTON HARBOR, MICHIGAN

MP MASTER
MA22769

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